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RYKER (T. C.). **Fusarium yellows of Celery.**—*Phytopathology*, XXV, 6, pp. 578–600, 4 figs., 3 graphs, 1935.

A full, tabulated account is given of the writer's studies at Wisconsin University on the pathogenicity, environmental relations, and cultural and pathogenic variability of the agent of celery yellows (*Fusarium* sp.) [*R.A.M.*, xiv, p. 498].

The symptoms of the disease were found to be well-marked and to agree with the published descriptions [ibid., i, p. 101; iv, p. 138]. In the greenhouse tests on Golden Self-Blanching and Michigan Golden Self-Blanching two types of chlorosis were differentiated according to the strain of the fungus used. One (produced only by a strain from Green Bay, Wisconsin) appeared as a yellow flecking due to a clearing of the tissue near the veins and to the progressive chlorosis of the small islands of foliar tissue subtended by the veinlets. Three other strains from Waukesha, Wisconsin, and one from Michigan at first caused clearing only near the larger veins, gradually followed by generalized chlorosis. The pathogenicity of the Wisconsin and Michigan strains did not differ essentially, but there were variations in the degree of virulence and in certain cultural characters. On potato-dextrose agar the minimum, optimum, and maximum temperatures for all strains were about 8°, 28°, and 36° C., good growth being made, however, throughout the range from 20° to 32°. The development of the host is favoured by soil temperatures between 18° and 28°, above which there is marked stunting. In the susceptible Golden Self-Blanching variety yellows developed at a soil temperature range of 18° to 32°, the incubation period decreasing proportionately with the increase of temperature up to 28°. The reaction of certain varieties was modified by soil temperature, Michigan Golden Self-Blanching being highly resistant only at 18°, Winter Queen and Curly Leaf Easy-Bleaching up to 26°, while Michigan Golden withstood infection by all the strains throughout the range investigated up to 31°. All inoculated varieties, whether they became diseased or not, revealed the presence of the *Fusarium* in the cortical region of the secondary roots, but only those manifesting yellows symptoms contained it in the vessels of the primary root. The virulence of the disease was less in relatively dry soils (50 per cent. of the water-holding capacity) than in damp ones (70 per cent.).

OKABE (N.). **Bacterial diseases of plants occurring in Taiwan (Formosa). V.**—*J. Soc. trop. Agric. Taiwan*, vii, pp. 57–66, 1935.

Brussels white-leaved chicory (*Cichorium intybus*) in the Taihoku district of Formosa is liable to a soft rot of bacterial origin almost identical in appearance with that due to *Bacillus aroideae* or *B. carotovorus* [*R.A.M.*, xiii, p. 492]. The lesions at first assume the form of water-soaked, warm- to cinnamon-buff streaks on the older petioles at or near soil level. Under humid conditions the streaks rapidly extend upwards to the midribs or leaf veins and turn warm sepia or snuff-brown. Complete rotting of the tissues ensues, followed by collapse of the affected leaves. On the leaf blades the water-soaked, chrysolite-green spots frequently show a sayal-brown centre and one to three yellowish-green concentric rings.

The causal organism, to which the name *Bacterium formosanum* n.sp. is given, is a motile rod with rounded ends and one to eight polar or rarely bipolar flagella, occurring singly, in pairs, or occasionally in short chains, and forming neither spores nor capsules; colonies on beef extract agar round to amoeboid, convex to raised, glistening, smooth, transparent, opalescent, bluish-, later greyish-white, producing a bluish-green fluorescence in bouillon and Uschinski's and Fermi's solutions; gelatine not liquefied; indol and ammonia formed, but no hydrogen sulphide; milk cleared without curd formation; nitrates not reduced; acid without gas from dextrose, galactose, mannose, levulose, mannite, and glycerine; good growth in Cohn's solution with crystal formation; minimum, optimum, and maximum temperatures and death point, 0° to 5°, 28° to 31°, 35° to 36°, and 61° C., respectively; viability in culture media extending up to 200 days.

Positive results were given by inoculation experiments on chicory, lettuce (*Lactuca sativa*, *L. debilis* Benth. et Hook, and *L. dracoglossa* Mak.), cucumber, potato, tomato, tobacco, carrot (roots), cabbage (including *Brassica pekinensis* and *B. chinensis*), turnip, beet, onion (*Allium cepa* and *A. fistulosum*), Oriental radish (*Raphanus acanthiformis* M. Morel), *Chrysanthemum coronarium*, *Calendula officinalis*, and other plants.

BUTLER (K. D.). **The Cotton root rot fungus, Phymatotrichum omnivorum, parasitic on the Watermelon, Citrullus vulgaris.**—*Phytopathology*, xxv, 6, pp. 559–577, 3 pl., 1 fig., 1935.

Watermelons in commercial plantings in Arizona are stated to have repeatedly been found susceptible to the attacks of the cotton root rot fungus (*Phymatotrichum omnivorum*) [*R.A.M.*, xiii, p. 350]. The fungus has been isolated from the roots of dying watermelon vines, grown in pure culture on potato-dextrose agar, and inoculated under controlled conditions with positive results on Iowa King, Iowa Belle, Pride of Muscatine, and Black-seeded Klondike watermelons and Acala cotton seedlings in the laboratory and field.

The initial invasion of the host tissues is frequently effected by intercellular 'wedging' of several or many hyphae, but single hyphae were also able to enter between two epidermal cells or directly into a cell. The entrance of the fungus in the cases studied was just behind the

root cap, but older roots are also invaded. Penetration of the walls of living cells appears to be accomplished partly by pressure and partly by a softening of the membrane, probably through enzymatic action, at the point of contact. The mycelium in the host tissues is either intra- or intercellular, the latter condition being most in evidence at first.

In pure culture *P. omnivorum* is inhibited or destroyed by the presence of *Trichoderma lignorum* [cf. ibid., xiv, p. 248], the mycelia of the two growing together without any trace of repellent action. After meeting, the growth of *P. omnivorum* ceased almost completely.

CHAZE (J.) & SARAZIN (A.). **Altération des constituants cytoplasmiques provoquée dans le Psalliote par parasitisme.**—[Modification of the cytoplasmic constituents induced by parasitism in *Psalliota*.]—*C.R. Soc. Biol., Paris*, cxix, 23, pp. 843–847, 3 figs., 1935.

The writers' observations on *Psalliota* [*campestris*] in the early stages of attack by *Mycogone perniciosa* [*R.A.M.*, xiv, p. 674], showed that the chief modifications in the hyphae of the former are a pronounced vesiculization of the chondriome elements, the presence of a larger number of crystals, excessive vacuolar fragmentation in the cells in proximity to the hyphae of the parasite, and nuclear multiplication on a large scale, the average number of nuclei in diseased cells ranging from ten to twenty compared with two or more, rarely four, in healthy ones.

Of the phenomena herein described only the last would seem to be an exclusive result of parasitism by *M. perniciosa*.

WARE (W. M.). **Mushroom-growing in the United States.**—*J. Minist. Agric.*, xlii, 2, pp. 113–119, 2 pl., 1935.

The author gives a brief account of the recent developments in the mushroom-growing industry in the United States, nearly three-quarters of which is centralized in the State of Pennsylvania. Some interesting comparisons are made between the practices in use and the results obtained there and in Great Britain [*R.A.M.*, xiv, p. 490]. While most of the fungal diseases of the crop are common to the two countries, *Xylaria vaporaria* [ibid., xiv, p. 346] and *Clitocybe dealbata* [ibid., xii, p. 611] are stated not to have been recorded so far in the United States, while *Pseudobalsamia microspora* [ibid., xii, p. 352] is unknown in England.

HARGREAVES (E.). **Entomological work.**—*Rep. Dep. Agric. S. Leone, 1933*, pp. 12–14, 1935.

It is mentioned in the course of this report that the dark-veined type of groundnut mosaic [one of three forms of the disease commonly confused under the term 'rosette' differentiated by the writer in the 1932 report of entomological work in Sierra Leone: cf. *R.A.M.*, xii, p. 5] is transmissible by *Aphis laburni*, the symptoms appearing after an incubation period of twelve or thirteen days.

VINAS (J.). **Qualités à exiger du sulfure de cuivre comme anticryptogamique.** [Requisite qualities in copper sulphide used as a fungicide.]—*Rev. Vitic., Paris*, lxxxii, 2134, pp. 325–326, 1935.

After referring to the recent papers by Branas and Dulac on the

value of copper sulphide with or without a vanadium salt as catalyser [*R.A.M.*, xiii, p. 714; xiv, p. 674] for the control of certain fungal diseases, e.g., vine mildew [*Plasmopara viticola*], the author states that the oxidizability of cupric sulphide depends much more on the method used in its preparation than on the presence of a catalyser, fineness of division being one of the chief factors in this regard. From the purely practical spraying standpoint it is further stated that finely divided particles of the substance take a very long time to be deposited, while colloidal solutions of the sulphide remain in suspension indefinitely. Contrary to Branas's and Dulac's opinion, he recommends that the prepared substance should be stored in dry powder form rather than in a damp condition, since the latter induces the formation of large crystals of copper sulphate. Vine-growers are recommended at present, only to make small-scale tests of copper sulphide sprays.

NIEMEYER (L.). **Die durch Pseudomonas tumefaciens (E. F. Smith et Townsend) Stevens verursachte Mauke der Weinreben.** [The Vine 'mauke' caused by *Pseudomonas tumefaciens* (E. F. Smith et Townsend) Stevens.]—*Zbl. Bakt.*, Abt. 2, xcii, 4–7, pp. 116–162, 8 figs., 1 diag., 1935.

An exhaustive, tabulated account, supplemented by a six-page bibliography, is given of the writer's studies and observations (mostly in the Moselle, Saar, and Ruwer valleys) on the so-called 'mauke' disease of the vine caused by *Bacterium tumefaciens* [*R.A.M.*, xi, p. 655].

A perusal of the relevant literature showed the first reference to the disorder to have been made by Hörter in 1822 in 'Der rheinländische Weinbau nach theoretisch-praktischen Grundsätzen für denkende Ökonomen.' I. Teil (128 pp., Koblenz). The symptoms as personally observed were found to agree in the main with the numerous descriptions that have been given of the disease, which does not appear, from information supplied by viticultural institutes, to be of appreciable economic importance in Germany. Among the chief contributory factors in the development of 'mauke' were found to be heavy, sticky soils, arrested growth from cold and hail injury, and drastic pruning, accompanied by an injudicious manuring scheme.

From tumours arising spontaneously and by inoculation, 115 strains of *Bact. tumefaciens* were cultured, 30 per cent. of which were capable of reproducing the symptoms, though their virulence was mostly of brief duration. The transmissibility of 'mauke' from vine to vine (by living and dead tissues and implements), from vine to tomato, from tomato to tomato, and from *Ricinus* [*communis*] to tomato was experimentally demonstrated. The importance of arrested growth of the host in the development of infection by *Bact. tumefaciens* was shown in the inoculation tests, in which under these conditions positive results were obtained as long as ten days after wounding. The longest incubation period of the organism in vines, apple seedlings, and *Pelargonium zonale* was nearly a year. The viability of *Bact. tumefaciens* persisted for 127 days in sand and for 54 in Devonian schist [cf. ibid., v, p. 495].

Fifteen vines cultivated on a commercial scale in Germany reacted similarly, as regards size and rapidity of growth of the tumours, to inoculation with very virulent strains of the 'mauke' organism; in tests

with a miscellaneous assortment of strains the infection data were too unequal and irregular to permit of a clear-cut statement respecting resistance and susceptibility. Vigorously growing, well-nourished plants were generally the most susceptible to infection. Conflicting results were given by experiments in the control of the disease, none of the measures so far adopted against which has proved uniformly successful. In general, however, the vines recover spontaneously or may be freed from the excrescences by appropriate pruning.

László (S.). **Újabb adatok a szölö lisztharmatjának áttelelésehez.** [Recent contributions to the overwintering of *Oidium*.]—*Rep. Hung. agric. Exp. Sta.*, xxxvii, 4–6, pp. 235–238, 1934. [German and French summaries.]

The perithecial stage (*Uncinula necator*) [*R.A.M.*, xiii, p. 398] of *Oidium tuckeri* is stated to have been recognized in Hungary since 1893, between which year and 1927, however, it occurred only sporadically on European vines. In the autumn of the latter year the fungus developed in profusion, especially on American varieties and hybrids of Riparia or Rupestris extraction, and the perithecia were detected exclusively in groups of 15 to 45 on the galls formed by *Phylloxera* [*vastatrix*].

Oversigt over Plantesygdomme. 207. Juli 1935. [Survey of plant diseases. 207. July, 1935.]—*St. plantepat. Forsøg, Kbh.*, 11 pp., 2 figs., 1935.

Among other items of interest in this report on the Danish phytopathological situation in July, 1935, are notes of H. R. Hansen on cereal, turnip, and potato diseases. Potato wart (*Synchytrium endobioticum*) was recorded from nine new localities [*R.A.M.*, xiii, pp. 721, 799]. Potato leaves at Tylstrup bore dark spots on both sides caused by *Cercospora concors* [ibid., xiii, p. 288], an occasional, relatively innocuous pathogen of this host.

Jones (G. H.). **Egyptian plant diseases: a summary of research and control.**—*Bull. Minist. Agric. Egypt*, 146, 45 pp., 8 pl., 1935.

In this bulletin the author gives a general review of the investigations into plant diseases and their control carried out by the mycological section of the Egyptian Ministry of Agriculture during the last nine years [cf. *R.A.M.*, v, p. 19]. The first part of the paper consists of notes on the geographical and physical characteristics of Egypt in relation to plant diseases, the most prevalent types of infection found, the lines upon which research has been conducted, the adaptation of control methods to local conditions, and legislation. In the second part the chief diseases occurring in Egypt [ibid., xi, p. 224] are listed under the common names of the hosts, with notes on their distribution, the losses caused by them, and their control. The paper concludes with a list of official publications on plant diseases issued by the Egyptian Ministry of Agriculture.

Nattrass (R. M.). **Annual Report of the Mycologist for the year 1934.**—*Rep. Dir. Agric. Cyprus, 1934*, pp. 45–49, 1935.

During the period under review wheat flag smut (*Urocystis tritici*) [*R.A.M.*, xiv, p. 83] was again general in Cyprus, causing considerable

damage throughout the wheat-growing areas. The two Australian resistant wheat varieties, 'Geeralying' and 'Nawaba' appear, from two seasons' observations, to be well suited to local conditions. A bacterial disease of wheat, probably identical with that caused by *Bacterium* [*Pseudomonas*] *tritici* [ibid., xii, p. 749], was observed in April for the first time; the affected plants showed twisting of the leaves, an exudation of yellow bacterial slime between the glumes and between the stems and sheaths, and produced no grain.

Heavy attacks of potato powdery mildew (*Oidium* sp.), first reported in Cyprus in 1933, occurred in June. An extensive survey failed to reveal the presence of onion smut (*Urocystis cepulae*) [ibid., xiii, p. 473] in Cyprus, though two undetermined species of *Urocystis* occur on wild *Allium*.

Oak trees in the Polis district were heavily attacked by a 'tar spot' identified at the Imperial Mycological Institute as *Trabutia quercina* (Fr. & Rud.) Sacc. & Roum. An undetermined species of *Naemospora* apparently caused the death of large numbers of *Populus nigra* trees; the fungus was also found attacking the walnut, alder, and hazel. *Pistacia* trees were heavily attacked by *Uromyces terebinthi* [ibid., viii, p. 339].

Wastage of Cyprus oranges on arrival at Covent Garden was almost entirely due to species of *Penicillium*; the amount of infection present increased as the season advanced. *Sclerotinia sclerotiorum* caused a rot of lemon fruits and a fungus with dilute brown, 1-septate pycnospores measuring 4 to 10 by 3 to 4 μ caused a twig die-back of the same host; it was identified at the Imperial Mycological Institute as *Diplodia* (*Microdiplodia*) *warburgiana* Reichert. Inoculation experiments on lemon trees in the open with the *Dothiorella* previously isolated from lemons affected with gummosis showed that the fungus is an active parasite, causing severe gummosis and large cankers. Lemon fruits attached to the tree were rapidly rotted by the fungus which worked down the fruit stalk and formed a canker at the junction of the stalk and twig.

Of four strains of cowpea, viz. Brabham, Victor, Iron, and Groit, resistant to *Uromyces vignae* [ibid., xiv, p. 614] introduced from the United States, the first-named gave the largest yield and the most vigorous plants; the last was discarded as too susceptible to attack by nematodes and *Macrophomina phaseoli* [ibid., xi, p. 711].

VAN DER GOOT (P.) **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1933.** [Diseases and pests of cultivated crops in the Dutch East Indies in 1933.]—*Meded. Inst. PlZiekt., Buitenz.*, 84, vii+79 pp., 1935.

The following are among the many items of interest in this report, prepared on the usual lines [*R.A.M.*, xiv, p. 152]. Citrus scab [*Sporotrichum citri*] on rough lemon, Japanese citron, Cleopatra mandarin, and other varieties in Batavia was reduced to a minimum by regular applications of 1·5 per cent. Bordeaux mixture [ibid., xiv, p. 692]. Heavy damage was caused in citrus groves by *Fusarium* (*Nectria haematococca*), the attacks of which were apparently favoured by the practice of interplanting with kapok [*Eriodendron anfractuosum*].

A species of *Cercospora* causing leaf and stem rot was responsible for

the failure of the *Chrysanthemum coronarium* crop in Priangan, Java, while pyrethrum (*C. cinerariifolium*) was severely injured during the rainy season by *Sclerotium rolfsii*.

In the Japara-Rembang Residency root rot of rice [ibid., xiii, p. 687] was more widespread than in the previous year, occurring over an area of 2,705 as compared with 1,619 hect.; the corresponding figures in Soerabaja were 6,013 as against 5,723 hect. in 1932.

The *Phytophthora* foot rot of pepper [*Piper nigrum*] in the Bengkajang and Singkawang subdivisions of West Borneo again assumed an epidemic form, and was also a source of heavy losses in the south and east of the island [ibid., xiv, p. 152].

Hevea rubber mildew [*Oidium heveae*: ibid., xiv, p. 331] was prevalent in West Java, where treatment on a limited scale has been instituted, but caused relatively little injury in the central regions. The most important bark disease in the Besoeki district is stated to be stripe canker [*P. palmivora*: ibid., xiii, p. 470], susceptibility to which was found to be a specific property of the clones. Mouldy rot [*Ceratostomella fimbriata*] spread very widely in 1933, and a bark canker (foot rot) affected five- to eight-year-old grafted trees at the junction of stock and scion. Infection by the latter was not readily discernible in the early stages, and below the bark decay was generally more advanced than the external symptoms suggested. Spontaneous healing took place in some plantations. *Xylaria thwaitesii* [ibid., x, pp. 126, 525] was observed on a number of coffee trees in a Central Java plantation. Top die-back (*Rhizoctonia* sp.) [ibid., xiv, p. 152] was for the first time definitely ascertained to be present in Malang. In Sumatra the disease occurred mainly in Moeara Laboeh, its purely sporadic development in the Ophir plantations being possibly limited by the more intensive tillage. The so-called 'bark-splitting' disease, of undetermined origin, appears to be gradually gaining ground in older plantations.

The P.O.J. 2967 sugar-cane variety appears to be very susceptible to mosaic without, however, suffering from the disease to any extent [ibid., xiii, p. 654]. The fields may be kept practically free from infection by strict attention to the health of the canes at the swarming time of *Aphis maydis*. Pokkah-boeng (*F. moniliforme*) [*Gibberella moniliformis*: ibid., xiv, pp. 153, 709] was favoured by the wet season, especially in West Java, and was also very prevalent in East Cheribon. Leaf scald [*Bacterium albilineans*: ibid., xiii, p. 686] was of restricted extent; P.O.J. 2967 seems to be rather susceptible to this disease also.

Pythium aphanidermatum caused at least as much damage in the Besoeki tobacco seed-beds as *Phytophthora* [*parasitica nicotianae*: ibid., xiv, p. 533]. The *Pythium* stem scorch, which causes such heavy damage in Deli (Sumatra) [ibid., xiii, p. 328] some three weeks after transplanting, has only once been observed at this stage in Besoeki.

Demolon (A.) & Dunez (A.) **Recherches sur le rôle du bactériophage dans la fatigue des Luzernières.** [Investigations on the part played by the bacteriophage in the exhaustion of Lucerne fields.] —*Ann. Agron., Paris,* N.S., v, 1, pp. 89–111, 8 figs., 1935.

The authors give details of laboratory and field experiments at Versailles, the results of which are interpreted to indicate that in many

instances the failure of lucerne fields of some years' standing is in great part due to the destruction of the nodule organism (*Bacillus radicicola*) by its bacteriophage [*R.A.M.*, v, p. 756] the presence of which, throughout the whole layer of soil penetrated by the lucerne roots, was conclusively established. Reinfection of the soil with the nodule organism occurs normally from the surface, but in heavy clay soils it progresses in depth very slowly; this may be remedied by resowing such exhausted soils with lucerne seed artificially inoculated with active cultures of the nodule organism, the isolation and culture of which on artificial media are discussed.

DUFRÉNOY (J.). **La bactériophagie en agronomie tropicale.** [Bacteriophagy in tropical agronomy.]—*Rev. Bot. appl.*, xv, 167, pp. 497–506, 1935.

After referring to the investigations of various workers on the bacteriophage of *Bacterium malvacearum* [*R.A.M.*, xiii, p. 697], *Bact. tabacum* [ibid., xiv, p. 154], *Pseudomonas* [*Bact.*] *tumefaciens* [ibid., xiii, p. 152], and of some other organisms, the author gives a brief account of the methods for its isolation, and also for increasing its virulence to the bacteria. He considers that these studies open up new horizons in the investigation of the causes of many hitherto inexplicable crop failures [see preceding abstract].

ARK (P. A.). **Filtrability of certain plant pathogenic bacteria.**—*Phytopathology*, xxv, 7, pp. 728–729, 1935.

Evidence is briefly presented of the capacity of *Erwinia amylovora* [*Bacillus amylovorus*: *R.A.M.*, xiv, p. 702], cultured in tubes of skimmed milk at 28° C., to traverse Berkefeld V and N and Chamberland L_3 filters after an incubation period of 7 to 36 days. Similar results were obtained with *E.* [*B.*] *carotovorus* [ibid., xiv, pp. 698, 730, and below, p. 807], in the case of which, however, no filterable forms developed where the degree of acidity reached P_H 6·6. Hydrogen-ion concentration of the medium, therefore, may be a limiting factor in this phenomenon. Neither organism produced a filterable stage in bouillon.

THOROLD (C. A.). **Diseases of cereal crops in Kenya Colony.**—*Bull. Dept. Agric. Kenya* 2 of *1935*, 66 pp., 16 pl., 1 fig., 1935.

In this valuable bulletin a concise, semi-popular account is given of the more important bacterial and fungal diseases in Kenya of maize (including streak), wheat, oats, barley, rye, sorghums (*Sorghum* spp.) and bulrush millet (*Pennisetum typhoideum*), together with a brief discussion of control measures. Numerous bibliographical references are appended to the descriptions of the individual diseases.

SPRAGUE (R.). **A preliminary check list of the parasitic fungi of cereals and other grasses in Oregon.**—*Plant Dis. Reptr*, xix, 11, pp. 156–186, 1935. [Mimeographed.]

The immediate purpose of this preliminary list of cereal and other grass pathogens occurring in Oregon is to facilitate ready reference to all known diseases of the crops liable to be used in rotation with

cultivated cereals. In the nomenclature of the grasses, Hitchcock's standardized usage has been followed (*Misc. Publ. U.S. Dept. Agric.*, 200, 1935). Arthur's recent manual [*R.A.M.*, xiii, p. 728] was used in the identification of the rusts, supplemented by Jackson's list of Oregon Uredinales (*Mem. Brooklyn bot. Gdn*, i, p. 198, 1918). The genus *Septoria*, represented on a large number of local hosts, is now being studied by the writer, who prefers to withhold final determinations of most of these species for the time being.

HANNA (W. F.) & POPP (W.). **Experiments on the control of cereal smuts by seed treatment.**—*Sci. Agric.*, xv, 11, pp. 745–753, 1935. [French summary.]

The authors give a brief tabulated account of field trials from 1930 to 1934, inclusive, at Winnipeg, to test the efficacy of 16 seed disinfectants in the control of wheat bunt (*Tilletia levis* and *T. tritici*) [*T. foetens* and *T. caries*], covered smut of barley (*Ustilago hordei*), and covered and loose smuts of oats (*U. levis* [*U. kolleri*] and *U. avenae*). Formalin (1 in 320 as a sprinkle) gave good control of all the five fungi, but under certain conditions it caused seed injury, besides being more difficult to apply than the dust treatments. The copper dusts tested (including copper carbonate, monohydrated copper sulphate, and basic copper chloride) controlled wheat bunt when the seed-grain was not too heavily contaminated with spores, and also gave good results with hull-less oats. Satisfactory control of wheat bunt, barley covered smut, and oats smuts was obtained with new improved ceresan [*R.A.M.*, xiv, pp. 221, 688], containing 5 per cent. ethyl mercury phosphate, and this dust, owing to the light rate at which it is applied ($\frac{1}{2}$ oz. per bush.) should not cause clogging of the drills. In a series of experiments, which are not reported in detail in this paper, there was evidence that seed treated with copper and mercury dusts gave a higher percentage of seedling emergence than untreated seed.

VONG-MAY (C.) & CHAN-TSI (W.). **Experiments on the control of cereal smuts by the hot-water treatment.**—*Agric. Sinica*, i, 7, pp. 189–238, 3 pl., 1 fig., 4 graphs, 2 diags., 1935. [Chinese, with English summary.]

A study since 1933 in China of the hot-water treatment against cereal smuts showed that barley covered smut (*Ustilago hordei*) and wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] can be entirely controlled by treatment with water at a temperature not below 57° C. for a period of not less than five minutes. Loose smut of barley [*U. nuda*] was not eradicated by treatment of the seed for 30 minutes at 56° or 3 minutes at 60°, but was easily controlled by a modified form of the treatment, comprising presoaking in cold water for 3 minutes and transferring to water at 50° for 5 minutes (3–50–5 formula). Loose smut of wheat [*U. tritici*] was prevented only by the modified treatment; there was no significant difference between the amount of infection in the untreated controls and that in plots where the seed had been treated for 1 to 30 minutes at 52° to 60°. The data obtained showed that in the modified treatment, as the temperature of the water was raised, so the presoaking and immersion periods could be reduced, and

vice versa, treatments with the formulae 3–58–5, 6–54–5, 8–52–5, 3–56–10, and 6–52–10 all preventing infection. The formulae 3–56–5, 3–52–10, 6–52–10, and 24–50–5 controlled the strain on Wutsin-Awnless wheat grown in Nanking, but not that on Lungtsin from Hangchow, which required more intensified treatments.

The germination capacity of wheat seed was not impaired by direct immersion in water at a temperature below 54° for a period not exceeding 20 minutes, or below 60° for a period not over 7 minutes. With some wheats, such as Wuchang 136 and Nanhsuchow, and some barleys, such as Tuchang and Hsiapu, germination was unaffected or slightly increased by the modified treatments, while with others, such as C.U. Quality and Wutsin-Awnless wheats and C.U. 158 and C.U. 103 barleys, germination was markedly reduced.

STELZNER (G.). **Einfacher Nachweis von Hyphen parasitärer Pilze im Halm der Gramineen.** [A simple method of detecting parasitic fungous hyphae in the haulms of Gramineae.]—*Phytopath. Z.*, viii, 4, pp. 369–372, 5 figs., 1935.

Details are given of a method for the examination of the haulms of Gramineae infected by parasitic fungi. The stalks should be cut about 4 cm. above and 1 to 2 cm. below the node, split into two or three longitudinal sections, thoroughly washed, fixed in absolute alcohol, stained either with cotton blue or (for specifically cytological purposes) haematoxylin, and thin sections of the parenchyma tissue transferred to glycerined slides.

Brief descriptions are given of the mycelia of *Helminthosporium gramineum* [*R.A.M.*, xiv, p. 27] and certain cereal smuts in the tissues of their hosts. In the case of *Ustilago avenae* on oats gemmae, as observed by Arland in the flowers [ibid., iv, p. 158], were detected in the haulm. This technique has further been found suitable for the study of latent infection in the Gramineae [ibid., xii, p. 209].

FISCHER (G. W.). **Comparative studies of certain cultures of Puccinia rubigo-vera and Puccinia tomipara on wild grasses.**—*Phytopathology*, xxv, 7, pp. 657–685, 1 fig., 2 diags., 1935.

A comprehensive, tabulated account is given of a series of comparative inoculation experiments at the State College of Washington with nine cultures of *Puccinia rubigo-vera* [*R.A.M.*, xiii, p. 185] from Michigan, Indiana, Ohio, and Kansas and one of *P. tomipara* Trelease (*Trans. Wis. Acad. Sci. Arts Lett.*, vi, p. 106, 1885) from Michigan on 111 collections of species and varieties of wild grasses. The latter is treated by Arthur [*R.A.M.*, xiii, p. 728] as a synonym of *P. rubigo-vera*, whereas Mains [ibid., xii, p. 499] accords it specific rank.

The resultant data showed the nine cultures of *P. rubigo-vera* to be physiologically distinct on the basis of the infection type induced by eight of them on *Agropyron*, *Elymus*, *Hordeum*, and *Hystrix* spp., and one on *Bromus* spp., while some were further differentiated by specialization on their aecidial hosts. For instance, two cultures produced aecidia on *Clematis virginiana*, three on *Impatiens biflora*, one on exotic species of *Thalictrum* (*T. minus*, *T. glaucum*, *T. flavum*, and *T. fendleri*), and one on the two native species of this genus, *T. dioicum* and

T. dasycarpum. *P. tomipara* was successfully inoculated into the above-mentioned species of *Thalictrum* (except *T. minus*), but only three of the 26 species of *Bromus* used in the tests proved highly susceptible to this rust, viz., *B. altissimus*, *B. ciliatus* (on both of which it occurs naturally in the field), and *B. purgans*.

Marked intraspecific reactional differences were observed between various wild-grass collections inoculated with the several cultures of *P. rubigo-vera*, a fact that emphasizes the necessity of using grasses of recognized genetic constitution in experiments of this nature. The degree of specialization presented by *P. rubigo-vera* is stated to be comparable to that characteristic of the races of cereal rusts. Certain cultures were found to differ considerably in spore measurements, especially in their mean uredospore width, the range for the species as a whole being 15 to 23 μ, but modes differed from 17 to 22 μ. The mean teleutospore width also varied, the range being 8 to 21 μ, whereas two cultures had mean diameters of 10·77 and 10·67 μ, respectively. The relative sizes of uredospores and teleutospores were not necessarily correlated and no relationship could be traced between spore size and host specialization.

The multicellular character of the teleutospores of *P. tomipara* remained constant through two generations, thereby establishing, in the writer's opinion, the claim of this rust to specific rank.

Hart (Helen) & Forbes (I. L.). **The effect of light on the initiation of rust infection.** *Phytopathology*, xxv, 7, pp. 715–725, 1 fig., 1935.

The writers discuss and tabulate the results of controlled experiments at the Minnesota Agricultural Experiment Station to determine the effect of light and darkness on the entry of the uredospore germ-tubes and subsequent development in the hosts of *Puccinia triticina* physiologic form 53, *P. graminis tritici* forms 21 and 49 [ibid., xiv, p. 687] on various wheat varieties, *P. antirrhini* on *Antirrhinum majus* [ibid., xiv, p. 498], *P. coronata* [*P. lolii*] on oats [ibid., xiv, pp. 567, 625], *P. helianthi* on sunflower [ibid., xii, pp. 318, 571], *P. sorghi* [*P. maydis*] on maize [ibid., xiv, p. 438], and *Uromyces appendiculatus* on beans (*Phaseolus vulgaris*) [ibid., xiv, p. 734].

Darkness at the time of inoculation and throughout the early stages of infection was found to diminish the prevalence and intensity of the symptoms induced by *P. graminis tritici* [ibid., xii, p. 498], especially on the susceptible Marquis, and *U. appendiculatus*, but did not affect the course of the disease in the case of *P. triticina* and *P. antirrhini*. The incidence of attack by *P. maydis* and *P. helianthi* was also reduced by darkness, which further slightly modified the severity of the symptoms, though not sufficiently to place the bulk of the plants in the 'light infection' class. The prevalence of infection by *P. lolii* on Gopher oats was not affected by darkness, which did, however, somewhat mitigate the severity of the attack on Victory.

Schilcher (E.). **Beitrag zur Rostfrage. (II. Mitteilung.)** [A contribution to the rust problem. (Note II.)]—*Z. PflKrankh.*, xlv, 6–7, pp. 316–335, 4 graphs, 1 map, 1935.

Further studies from 1932 to 1934 on physiologic specialization in

brown rust of wheat (*Puccinia triticina*) in Austria [*R.A.M.*, xiii, p. 83] showed form XIII to be most widely distributed, followed by XV [ibid., xiv, p. 227], whereas XIV, XVI, and XX occurred sporadically and XXI was represented only in one Austrian and one Hungarian collection [ibid., xiii, p. 755]. All the 28 wheat varieties tested for their reaction to the six above-mentioned biotypes of *P. triticina* were more or less severely attacked by the several physiologic forms. Field observations during the period under review showed that the date of onset of *P. triticina* amd *P. glumarum* may vary by as much as one month [cf. ibid., xiv, p. 500] according to the prevailing meteorological conditions, early invasion being mostly followed by heavy attacks, while pustule formation is relatively scanty in the case of late infection. Even ordinarily susceptible varieties may assume an appearance of resistance in years unfavourable to rust development.

Bockmann (H.). **Über die Halmbruchkrankheit des Weizens.** [On the straw-breaking disease of Wheat.]—*Dtsch. landw. Pr.*, lxii, 30, p. 369, 1935.

Following up his recent observations on the factors involved in the etiology of lodging of wheat (*Cercosporella herpotrichoides*) in Schleswig-Holstein [*R.A.M.*, xiv, p. 689], the writer seeks to reconcile the apparently conflicting evidence as to the frequent losses from this disease among crops following the admittedly resistant Leguminosae. The explanation apparently lies in the ability of the fungus to persist on stubble refuse from the crop preceding the leguminous one. Care should thus be taken, not only to plough the stubble deeply under the soil immediately after harvesting, but also to avoid bringing it to the surface in the course of the next season's ploughing. Luxuriance of growth in the host is considered to be an important factor in the extent of the damage from this disease.

Simmonds (P. M.), Russell (R. C.), & Sallans (B. J.). **A comparison of different types of root rot of Wheat by means of root excavation studies.**—*Sci. Agric.*, xv, 10, pp. 680-700, 9 figs., 1935. [French summary.]

A tabulated account is given of the authors' comparative studies in 1933 and 1934 at Indian Head, Saskatchewan, of the root systems of healthy wheat (Marquis) plants and of plants affected with common root rot (*Helminthosporium sativum* and *Fusarium* spp.) [*R.A.M.*, xiv, p. 688], take-all (*Ophiobolus graminis*) [ibid., xiv, p. 689], and browning root rot (*Pythium* spp.) [ibid., xi, p. 294]. Common root rot is characterized by brown lesions in the subcoronal internodes and roots of seedlings, which spread by mid-season to the crown and basal leaf sheaths. By the time the healthy plants were nearly mature severe lesions were abundant on the basal parts of diseased plants. Both roots and tops of mature plants are stunted and the yield was only 70 per cent. of the normal.

Take-all causes dark brown or black lesions on the roots and subcoronal internodes of seedlings. The seminal root system is almost completely destroyed by mid-season and is quite dead by the time the crop is ripe. The tops are greatly stunted and almost completely

bleached; the heads were either empty or partially filled with shrunken grain and the yield from diseased plants was only 20 per cent. of that of healthy ones.

Browning destroyed many of the lateral seminal rootlets and many of the crown roots, with the result that most of the leaves died and the seedlings became markedly stunted. Partial recovery followed, due to the continued growth of the seminal roots and of the few crown roots that escaped destruction, but the plants remained greatly stunted and the yield only amounted to 20 per cent. of the normal.

The results of the investigation indicated that the damage caused is approximately proportional to the portion of the root system destroyed, and that the losses from light infections often pass unnoticed, though they are quite considerable in the aggregate. Severe amputation of the seminal root system, whether caused by mechanical means [ibid., xii, p. 501] or by parasitic fungi, tends to reduce the number of tillers and to retard the maturity of the wheat plant, while severe amputation of the crown roots hastens maturity.

Ullstrup (A. J.). **Studies on the variability of pathogenicity and cultural characters of Gibberella saubinetii.**—*J. agric. Res.*, li, 2, pp. 145–162, 6 figs., 2 diags., 1935.

An account is given of the author's studies of the variations occurring under controlled conditions in the pathogenicity and cultural characters of lines of *Gibberella saubinetii* [*R.A.M.*, xiv, p. 720] originally derived from single ascospores isolated [by a method which is described] in sets of eight from the ascospores of a single ascus, or from the tips of the germ-tubes produced by the ascospores; the perithecial material used was collected in 1933 from barley fields in Illinois, Iowa, and Minnesota. The results showed that all the original cultures were strikingly similar in their behaviour irrespective of the locality from which the perithecia had been collected, while considerable variations occurred in the subsequent subcultures, most of which were made from single conidia. The variations were more or less haphazard, and did not appear to be caused by an orderly segregation within the ascus. Subcultures also differed widely in the ability to cause seedling blight of maize, some being highly virulent while others were practically non-pathogenic. The virulent cultures were always characterized by a rapid radial growth and an abundance of aerial mycelium, while the non-virulent cultures grew relatively slowly and exhibited a pionnotes type of growth. No correlation could be established between abundant conidial production and degree of pathogenicity. Passage during one season through the host did not appear to have any influence on the cultural characters of the isolates.

The investigation is considered to suggest that the variability observed may be due either to abnormal nuclear divisions with subsequent reassortment and segregation of a new nuclear complex, or to the existence of true mutants.

Bevilacqua (I.). **La micosi del Grano.** [The Wheat mycosis.]—*Istria agric.*, N.S., xv, 14, pp. 317–319, 1935.

In 1935, wheat growing near Trieste was very severely damaged

owing to infection by *Dilophia graminis* [*R.A.M.*, iv, p. 150; x, p. 75], most of the ears being affected before they had become freed from the leaf sheaths. Control measures comprise cutting the wheat high, burning the stubble, and disinfecting the seed with Caffaro powder.

Vilkaitis (V.). **Apie Rudųju rūdžiu, Puccinia dispersa Erikss., žiemojima.** [The overwintering of brown rust of Rye, *Puccinia dispersa* Erikss.]—Reprinted from *Annu. Acad. Agric. Dotnuva*, ix, 10 pp., 1935. [Lithuanian, with French summary.]

Differences were observed in the extent of brown rust (*Puccinia dispersa*) [*P. secalina*] infection on rye sown at various dates in the autumn of 1934 in Lithuania, the highest incidence occurring among the sowings made on 5th September, slight infection in those made on 6th October, and none in those of 16th October [*R.A.M.*, xiv, p. 689]. Lochows Petkus rye was successfully inoculated in the laboratory with uredospores brought from plants of the same variety in the field up to 20th February, 1935, whereas negative results were given by similar tests in March, at which time it is already becoming difficult to detect the uredospores on outdoor plants. With uredospores collected on 26th December the writer obtained 9·9 per cent. infection on laboratory plants inoculated on 9th April, 104 days later, while small amounts of rust also developed from inoculations made on 30th April and 20th May, 125 and 145 days, respectively, after collection. On the basis of these results the author concludes that *P. secalina* overwinters and probably persists throughout the year in the form of uredospores, although from the beginning of spring up to earing of the rye these spores are difficult to find [ibid., viii, pp. 362, 707, cf. also xiv, p. 499].

Davis (G. N.). **Some new aspects of Maize smut.**—*Iowa St. Coll. J. Sci.*, ix, 3, pp. 505-507, 1935.

Inoculations at the spiral whorl of maize plants with a spore suspension of maize smut [*Ustilago zeae*: *R.A.M.*, xiv, p. 436] in various decoctions gave the best results when 1 per cent. fish oil soap-carrot decoction, which had the lowest surface tension, was used (92·3 per cent. infected plants with galls on 69·2 per cent.). Reputedly very resistant plants produced up to 30 per cent. infection when inoculated with spores in this decoction. Many small galls, not large enough to rupture the leaf sheaths, were found at the nodes, indicating that the leaf sheath should be removed when varieties are tested for smut resistance.

Since nodal infections appear late in the season and often in times of drought it was suspected that smut mycelium may lie dormant in the axillary buds for a long period; and evidence is adduced to this effect from a series of experiments during 1931 to 1934, in which inoculated and non-inoculated plants were injured about the middle of August, by the removal (*a*) of the tops, (*b*) of the ears, and (*c*) of the tops and ears. This treatment induced the development of the axillary buds and resulted, in the non-inoculated plants, in increases of 0, 23·3, and 45·1 per cent. nodal smut galls, respectively, over the controls, whilst the inoculated gave increases of 20·4, 15·6, and 31·7 per cent., respectively. Furthermore, histological examination of 262 axillary buds showed 140 to be infected, indicating that a large number of infected buds never

produce smut galls. On the basis of these results the author concludes that the maize smut infects the host at an early stage of development and that stimulation of the axillary buds, which is very marked in dry years, occasions a corresponding development of nodal smut boils as a result of this activity.

McNew (G. L.). **Preliminary studies on the effect of filtrates from cultures of Diplodia zeae upon seedling blight of Maize.**—*Iowa St. Coll. J. Sci.*, ix, 3, pp. 481–487, 1935.

Maize seedlings grown from seed severely infected by *Diplodia zeae* [*R.A.M.*, xiv, p. 437] were found to develop less blight when the seed had been immersed before planting in a cultural filtrate of the pathogen (passed through a Berkefeld 'W' filter) than when it had not been so treated. This result appeared to be independent of the kind of culture media used, but it was necessary for the fungus to have passed the period of active growth before the filtrate became effective. The influence of the filtrate on emergence was pronounced at 16° C., but very slight at higher temperatures. The filtrate did not prevent infection by stimulating abnormally rapid plant growth or by completely preventing fungal growth. The beneficial component in the filtrate being thermostable and non-volatile, it was possible partially to purify it by distilling off the volatile fraction, which was slightly toxic to the plants.

Reddy (C. S.). **Relation of rate of planting to the effect of Corn seed treatment.**—*Iowa St. Coll. J. Sci.*, ix, 3, pp. 527–538, 4 graphs, 1935.

Experiments conducted from 1930 to 1934, inclusive, in Iowa to ascertain the influence exerted by density of stand on the results of seed dust treatment of maize either practically disease-free or moderately infected with *Diplodia* [*zeae*: *R.A.M.*, ix, p. 521], *Gibberella* [*saubinetii*], or *Basisporium* [*Nigrospora* sp.: ibid., xiii, p. 299; xiv, p. 437] demonstrated that artificial thinning by injuring the yield may introduce an uncontrolled factor into seed treatment tests. A study of the relationship of field stands to yields showed that stands and yields are positively correlated up to a certain point, but beyond this point of most production (which varied from 7,000 plants per acre in 1930 to 13,000 in 1931) the higher the stand the lower the yield. Increased yields were recorded as a result of seed dust treatment in stands lower than the most productive, the increased yields being 4·4, 3·3, 2·7, and 1·1 bushels per acre, whereas in stands higher than the most productive the effect of seed treatment was to alter the yield by 2·5, —1·3, 1·9, and —0·7 bushels per acre. These latter figures show two significant increases, while the decreases are not significant, so that the plants from the treated diseased seed were more productive than those from the untreated diseased seed. Seed treatment killed, inhibited, or delayed fungal action, the data strongly indicating that the result of the treatment was not confined to its effects on the stands.

Wellhausen (E. J.). **Genetic investigations of bacterial wilt resistance in Corn as caused by Bacterium stewarti (Smith) Migula.**—*Iowa St. Coll. J. Sci.*, ix, 3, pp. 539–548, 1 pl., 1 diag., 1935.

A study of the inheritance of resistance to bacterial wilt of maize (*Bacterium* [*Aplanobacter*] *stewarti*) [*R.A.M.*, xiv, p. 503 and next

abstracts] made with 56 inbred lines and certain single crosses submitted to artificial wound inoculations showed that most of the field maize inbred lines were resistant, most of those of the Evergreen group were intermediate, and most of the early sweet corn inbred lines were susceptible. Dominance of resistance was found in all the F_1 material tested; in a few cases the F_1 individuals were more resistant than the parents. The results of the back-cross and later generation progenies of the crosses OSF × WF and OSF × W–134 showed definite segregation of factors for resistance with a strong indication that two major dominant complementary genes, with perhaps a third modifying one, were involved.

Histological investigations showed that in very resistant seedlings about 10 per cent. of the bundles became infected shortly after inoculation, whereas after two months only very seldom was such infection seen. Reaction to invasion varied in susceptible lines and certain inbreds showed a modified development of the bundle following infection of the protoxylem, the parenchyma cells around which were replaced by heavily lignified cells radiating in all directions. This condition was not found in the most susceptible W–134, which may partly account for its readiness to wilt after infection.

Mahoney (C. H.) & Muncie (J. H.). **Is resistance to bacterial wilt in Sweet Corn heritable?**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 458–473, 1935.

A tabulated account is given of the writers' experimental studies in Michigan on the inheritance of resistance to bacterial wilt (*Phytomonas* [*Aplanobacter*] *stewarti*) [see preceding and next abstracts], the results of which showed that hybrid varieties tend to be equally susceptible in the field with open-pollinated types of comparable maturity date. Attempts to correlate wilt percentage with maturity, yield, and seedling infection gave negative results, as did also various other genetical investigations. Arising out of the data obtained in 1933–4 is the problem of what constitutes resistance of maize to bacterial wilt in the field, i.e., whether it is a true, inherent resistance or due to tolerance of the organism or merely ability to escape attack under favourable environmental conditions. Both the two last-named types of resistance appear to exist, the incidence of infection among the early varieties in a given season being largely determined by the weather (disease escape), while an innate capacity to withstand the disease ensures the survival of a sufficient number of late-maturing individuals to produce a fair crop (disease tolerance). The only strains in these tests showing really low percentages of infection were markedly vigorous hybrids, of which one parent was an inbred of a cross between Evergreen sweet corn and Reid's yellow dent field maize.

Elliott (Charlotte). **Dissemination of bacterial wilt of Corn.**—*Iowa St. Coll. J. Sci.*, ix, 3, pp. 461–480, 4 pl., 1935.

After referring to the unprecedented severity of the outbreaks of maize bacterial wilt (*Aplanobacter stewarti*) that occurred in the United

States in 1932 and 1933 [*R.A.M.*, xiii, p. 571 and preceding abstracts], the author briefly reviews the history of the disease and states that evidence has been obtained indicating that *A. stewarti* probably overwinters in the flea-beetle (*Chaetocnema pulicaria*), found by Rand to carry the disease to large percentages of maize plants. Isolations from 175 overwintered adult beetles collected in April 1934 showed the wilt organism to be present in 19 per cent. In the summer of 1934 *Euchlaena mexicana* plants growing in the field in Maryland showed natural infection by *A. stewarti*.

MATTHEWS (I.). **The zinc sulphate treatment for mottle leaf of Citrus trees in the Sundays River Valley. Progress report.**—*Citrus Grower, 1935*, 41, pp. 30–32, 1935. [Afrikaans translation.]

The incidence of mottle leaf on Navel and Valencia oranges in the Sundays River Valley, Pretoria, is stated to have been reduced from between 50 and 80 per cent. to a minimum by the zinc sulphate treatment [*R.A.M.*, xiv, p. 628] which has been applied since 1933. The compound may be given either as a soil application at the rate of 8 lb. per tree in a strip of 18 to 24 in. round the trunk, or as a spray consisting of 10 lb. zinc sulphate (23 to 25 per cent. zinc), 5 lb. hydrated lime, ½ lb. spreader, and 100 galls. water.

FINCH (A. H.), ALBERT (D. W.), & KINNISON (A. F.). **Progress on the control of Citrus chlorosis or decline.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 20–23, 1 fig., 1935.

The symptoms of citrus chlorosis in Arizona are briefly described and notes given on experiments in its control by the insertion of ferric citrate through holes in the trunks, soil applications of ferrous sulphate, and other less generally satisfactory methods of applying iron to the trees [*R.A.M.*, xiv, p. 561]. This disorder, which appears to be undoubtedly related in some way to iron metabolism, is stated to affect over twenty different plants in the State. In citrus the first symptoms usually appear at an age of 8 to 12 years and are most conspicuous at 18 to 20.

MENCHIKOWSKY (F.) & PUFFELES (M.). **The ratio of Ca, Mg : K, Na, and the chlorosis of Grapefruit trees in the Jordan Valley.**—Reprinted from *Hadar*, viii, 6, 14 pp., 1935.

Chemical investigations on the chlorosis of grapefruit occurring in plantations at the Agricultural Experiment Station, Jericho, showed that this disease could not be attributed to the chlorine present in the soil or irrigation water, to the absence of iron or magnesium, or the presence of boron in the soil. Abnormally low ratios of K_2O+Na_2O to $CaO+MgC$ were found in the soil of affected plantations (e.g., 0·098 as against 0·128 normally) and in the ash of leaves from affected trees (e.g., 1·519 as against 2·490), and the authors conclude that the disease is the result of disturbed metabolism consequent upon these soil conditions, which furthermore increase the sensitivity of the trees to chlorine.

Wager (V. A.). **Bleaching Citrus fruits for the removal of the sooty blotch blemish.**—*Citrus Grower, 1935*, 40, pp. 42–46, 1935. [Afrikaans translation.]

Details are given of laboratory experiments in the control of sooty blotch of Navel oranges (*Gloeodes pomigena*) in South Africa [*R.A.M.*, xiii, p. 437], from which it appears that excellent results were obtained with eusol (chloride of lime and boracic acid) at 1 oz. to 1 lb. per gall. of water, the treatment at the two lowest concentrations requiring three and five minutes, respectively, while at the three higher ones it occupied only half a minute. The fruit thus treated was of an even brighter and more attractive appearance than that immersed in chloride of lime alone, though the latter was well up to standard.

Baker (R. E.). **Citrus fruit-rots in Trinidad.**—*Trop. Agriculture, Trin.*, xii, 6, pp. 145–152, 2 graphs, 1935.

As a result of investigations during the 1934–5 season the author states that rotted grapefruit was hardly ever found on the trees in Trinidad, unless the fruit had been mechanically injured by some external cause. In storage, wastage of grapefruit, apart from that due to chilling or desiccation, was chiefly caused by *Botryodiplodia theobromae* [cf. *R.A.M.*, xiii, p. 456], *Penicillium digitatum* [ibid., xiv, pp. 182, 577], and *Colletotrichum gloeosporioides* [ibid., xiv, p. 183], while rots caused by other fungi, including *Phomopsis* [*Diaporthe*] *citri* [ibid., xiv, p. 182], *Dothiorella* [*Botryosphaeria*] *ribis*, *Penicillium italicum* [loc. cit.], and others, occurred very occasionally. The fact that *Phytophthora parasitica* and *P. palmivora* [ibid., xiv, pp. 506, 692] have never been observed to cause wastage in storage appears to be due to the practical incapacity, established experimentally, of these fungi to develop at the temperatures at which grapefruit is usually stored for shipment (53° F. or less). Besides these several other fungal rots were observed in the packing sheds. A full description is given of the character of the rots caused by the various organisms, as well as a tabulated account of inoculation experiments with them on Marsh grapefruit. *Trichoderma lignorum* [ibid., xiii, p. 775] has not been found causing primary rot of citrus fruits in Trinidad, and all inoculation attempts with it have given negative results.

Tomkins (R. G.) & Dreyer (D. J.). **Brown markings on S.A. Citrus fruits.**—*Citrus Grower, 1935*, 41, pp. 1–4, 33–35, 37–38, 40–42, 44, 46–48, 17 figs., 1935. [Afrikaans translation.]

Oranges and grapefruit from the Eastern Transvaal and East and West Cape are stated to have frequently arrived at the English markets during the 1934–5 season showing various types of brown markings and spotting. Low temperature breakdown, affecting fruit stored at or below 40° F. during the three weeks' voyage from South Africa, assumes the form of definite sunken areas, sometimes surrounded by a more faintly discoloured halo in which the browning is confined to the tissue between the oil cells, suggesting that the disturbance is partly due to the liberation of oil and subsequent damage to the tissues. Grapefruit from Portuguese East Africa, which is 33 days in transit, is

reported to have suffered from this type of injury for several seasons. It has been experimentally shown with 175 cases of Beira grapefruit that the disorder may be obviated by carrying the fruit at 52° F., but it is as yet uncertain to what extent this practice is commercially feasible. The Marsh Seedless variety appears to be the most susceptible to low temperature breakdown, Walters and Foster less so, and Triumph comparatively resistant.

Button browning or incipient stem-end rotting and corky lateral browning associated with *Colletotrichum gloeosporioides* and *Alternaria citri* [*R.A.M.*, xiv, pp. 628, 692] were largely, though not exclusively, found in ethylene-treated fruit [cf. ibid., xiv, p. 578]. In the centre of the fairly soft, leathery spots characteristic of this type of damage, the oil cells had collapsed and the loss of water resulted in a smooth, somewhat silvery aspect. Oleocellosis [ibid., xiv, p. 356] is another common trouble among South African oranges, especially those that have been artificially ripened. Browning is confined to the tissue between the oil cells, the markings being irregular in size and outline but not modifying the contour of the fruit. On the other hand, in the case of injury due to low temperatures in the groves before picking, the brown areas are fairly regular, but the collapse of the cells causes pitting and thus induces a distinct change in the shape of the orange.

All these disturbances are thought to be interrelated and dependent on a number of factors necessitating local investigations before any definite scheme of control can be evolved. Some tentative suggestions, however, are made for improvements in current methods of handling the fruit.

Beckley (V. A.). **Observations on Coffee in Kenya. Pt. I. Chlorosis and die-back in Coffee.**—*Emp. J. exp. Agric.*, iii, 11, pp. 203–209, 2 pl., 1935.

In East Africa coffee plantations are sometimes so severely affected with chlorosis [*R.A.M.*, x, p. 519] as to show up as yellow patches in the general landscape. Four types of the disease are discussed in this paper. The first is ascribed to nitrogen deficiency and is usually accompanied by die-back of the branches, while the roots are unaffected. The loss of crop is severe, but the disease is arrested by the application of nitrogenous manures. The second type, associated with a severe die-back of both branches and roots, is attributed to carbohydrate deficiency caused by overbearing. The two other forms recognized cannot yet be assigned to any definite causes.

Clara (F. M.). **A new disease of Cotton (Gossypium sp.) in the Philippines.**—*Philipp. J. Agric.*, vi, 2, pp. 217–225, 3 pl., 1935.

Since 1932, cotton at the Central Experiment Station, Manila, has been affected by *Bacterium malvacearum* [cf. *R.A.M.*, ii, p. 445], *Glomerella gossypii* [ibid., xiii, p. 804], and *Colletotrichum gossypii* [? *G. gossypii*: ibid., ix, p. 32], as well as by the following diseases not before observed in the Philippines, viz., *Helminthosporium* blight, *Cercospora althaeina* [ibid., xiv, p. 195], club leaf or cyrtosis [ibid., xi, p. 298], and an *Alternaria* leaf disease.

Helminthosporium blight [ibid., v, p. 423] produces circular to very

irregular, zonate, brown spots of various sizes on the leaves, chiefly the lower ones. Infected tissue may fall, producing a shot hole effect, and when severely attacked the leaf may be shed. The bracts and bolls are also involved, and badly infected plants are stunted. During the last two seasons the disease has caused considerable damage, though less in 1934 than in 1933. Infection was very probably introduced on cotton seed brought from abroad.

Inoculations of pot plants with pure cultures of the organism gave positive results on 13 out of 20 plants, the lesions being circular and brownish, but without concentric zonation. The mature, but not the youngest, leaves and bolls readily became infected.

A comparison of the morphological characters of the author's fungus with those of *H. gossypii* reported from Porto Rico [loc. cit.] showed differences in the size of the conidia and the conidiophores, the conidia of the Philippine organism measuring 77 to 164·65 by 12 to 16 (average 115 by 14·3) μ and the conidiophores 81 to 162·8 by 5·5 to 7·4 μ. As, however, the Philippine fungus exhibits considerable variability and is closely similar to the Porto Rican in other characters the author refers it to *H. gossypii*.

Control consists in the selection, careful handling, and disinfection of the seed.

Massey (R. E.). **Section of Botany and Plant Pathology, G.A.R.S. Report by Mr. Massey on experimental work carried out by the staff of the section during season 1933–34.**—*Rep. Gezira Agric. Res. Serv., 1934*, pp. 119–141, 1 diag., 1 graph, 1935. [Mimeographed.]

In 1934, the cotton wilt found every year for the last ten years towards the end of October in the Gezira area of the Sudan [*R.A.M.*, xiv, p. 358] was observed on about 9th November. During December it became prevalent all over the Gezira Research Farm, the mortality averaging about 2·5 per cent., but in the worst spots reaching up to 15·3 per cent. Heavy shedding of leaves, buds, and bolls was general throughout the Gezira in November and December, the estimated yield of the crop being halved in two months owing to the loss of unripe bolls, many of which showed no sign of disease. In general, the greatest losses occurred between mid-November and mid-December. The root systems of plants dead or wilting were severely affected and marked destruction of the fine rootlets was usual even in plants not actually wilting. The finest rootlets showed heavy fungal invasion, the most striking feature being the presence in Sakel rootlets of the vesicles of the Phycomycetoid endophytic fungus [ibid., xiv, p. 248]. Other fungi isolated included *Fusarium solani* [ibid., xiii, p. 696], *F. scirpi* var. *caudatum* [ibid., xiii, pp. 128, 593] (a parasite of *Hibiscus esculentus*), *Gibberella moniliformis*, a species probably belonging to section *Elegans* or *Martiella*, a fungus apparently agreeing with *F. falcatum*, *Macrophomina phaseoli* (possibly two strains), and a pycnidial fungus resembling *Ascochyta gossypii*. From the beginning of the investigation in December *Pythium* species were obtained from the blackened stumps of affected rootlets. It was also found that unsterilized extracts of Gezira soils taken from the surface or from a depth of over two feet

produced on cotton seedlings grown therein suppression of root development, browning, and a slimy rot. The disease was also associated with soils having a high alkali content. The evidence as a whole strongly indicates that a group of fungi exert a seasonal attack on the root system, beginning probably at the end of September and extending throughout October and early November. In years of heavy rainfall this preliminary attack, probably due to *Pythium*, is followed by root invasion by other fungi.

For the first time in the Gezira the leaf curl damage from ratoon cotton was largely eliminated by pulling up the crop at the end of the season [ibid., xiii, p. 697]. Although diseased plants could be found in the new crop from 4th October onwards, the disease did not become really noticeable in any part of the Gezira until very late in the season.

Blackarm [*Bacterium malvacearum*: ibid., xiii, p. 765; xiv, p. 358] was present everywhere on the Gezira Research Farm by the end of November, but was really serious only where heavy initial infection had been present. Confirmation was obtained of the view previously expressed [ibid., xiii, p. 696] that the main source of infection of the new crop is adjacent land on which cotton has been grown the season before. A further test on the effect of flooding on destroying *Bact. malvacearum* in plant remains [loc. cit.] showed that plots sown after being spread with infected débris and then flooded for 4 and 2 days averaged, respectively, 2·1 and 2·8 per cent. blackarm, as against 69·5 per cent. for the controls not subjected to flooding. The leaves in the flooded series were only slightly spotted, whereas in the controls the lesions were larger, often running down the veins.

An active bacteriophage [ibid., xiii, p. 697] was again isolated from Blue Nile flood water (September), but all attempts to detect it in Blue or Main Nile water during winter (January onwards) failed. It was found in every sample examined of Gezira soil taken from plots that had recently borne infected cotton and its formation was induced in garden soil by repeated inoculations with a non-lytic culture of *Bact. malvacearum*.

LAVIER (G.). **Sur une Nucleophaga parasite d'Entamoeba ranarum.**— [On a species of *Nucleophaga* parasitizing *Entamoeba ranarum*.]— *Ann. Parasit. hum. comp.*, xiii, 4, pp. 351-361, 1 pl., 1 fig., 1935.

An account is given of an apparently undescribed Chytridiaceous parasite of the nucleus of *Entamoeba ranarum* occurring in *Alytes obstetricans* tadpoles from the Côte-d'Or, France, which is named *Nucleophaga ranarum* [without a Latin diagnosis]. After having gained entrance into the host nucleus, the parasite at first appears as a small, greyish, finely granulated body which later divides into a central mass and a ring of peripheral chromatic masses, presumably representing nuclei of the organism; these masses progressively increase in number until the greatly hypertrophied nucleus of the host is filled with them; at this stage the masses are transformed into spores, elliptical rather than spherical in shape and about 2 μ in their longest diameter. No sporangial envelope has so far been seen, and the spores appear to be dispersed with the rupture of the host nucleus.

Couch (J. N.). **A new saprophytic species of Lagenidium, with notes on other forms.**—*Mycologia*, xxvii, 4, pp. 376–387, 40 figs., 1935.

A detailed description [but no Latin diagnosis] is given of a new species of *Lagenidium*, named by the author *L. giganteum*, which was found in North Carolina weakly parasitic on mosquito larvae, and in Virginia on *Daphne* and copepods. Inside the host insect the fungus forms hyphal segments measuring 50 to 300 by 6 to 40 μ, any one of which may develop into a sporangium. Numerous slender external hyphae extend from the host to a distance of 1 or 2 mm. to form a fringe which has much the appearance of a delicate species of *Aphanomyces*; most of these hyphae are long emergence tubes for the sporangia, the contents of which are emptied as an undifferentiated, naked mass (sometimes several masses). Eventually this mass differentiates into a variable number of monoplanetic, kidney-shaped, laterally biciliate zoospores, 8 to 9 by 9 to 10 μ in diameter. The fungus was cultured on a variety of media, on some of which it formed an extensive mycelium.

Notes are also given on five other species (one doubtful) of this genus.

Redaelli (P.) & Ciferri (R.). **A propos de nouveaux synonymes probables de Torulopsis neoformans (Sanf.) Red. 1931.** [Concerning some new probable synonyms of *Torulopsis neoformans* (Sanf.) Red. 1931.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 7, pp. 243–244, 1935.

After referring to Giordano's recent studies on *Torulopsis neoformans* [*R.A.M.*, xiv, p. 694] the authors state that in all probability *Cryptococcus guilliermondi*, *C. kleini*, *C. plimmeri*, and *C. breweri* are also identical with this species, though in the absence of authentic material their opinion is based only on the published descriptions of these organisms. All show more or less viscous, shining colonies, spherical or spheroidal cells surrounded by a mucous capsule, an inability to ferment carbohydrates, and a ready adaptability to different media.

Gomez-Vega (Paulina). **Mycostatic studies on certain Moniliae and related fungi.**—*Arch. Derm. Syph., Chicago*, xxxii, 1, pp. 49–58, 1935.

Crystal violet and its compounds, gentian and methyl violet [*R.A.M.*, xiv, p. 584], showed marked specific action or selective activity *in vitro* on *Monilia* and *Torula* spp. isolated from human patients at Bogota, Colombia, inhibiting growth at concentrations of 1 in 1,000,000. The first-named has further given promising results in the clinical treatment of monilial paronychia [ibid., xi, p. 714] and of onychia associated with (?) *Trichophyton*. Mercurochrome showed no fungistatic [growth-inhibiting] action in dilutions of 1 in 500, but proved to be a powerful sensitizer to visible light, inhibiting the growth of *M.*, *T.*, *Epidermophyton*, and *Saccharomyces* spp. at 1 in 10,000 after a brief exposure to sunlight. A strong fungicidal action was exerted by cresol, which destroyed the above-mentioned organisms in half a minute at 1 in 250.

Woodward (J. G.), Kingery (L. B.), & Williams (R. J.). **The fungicidal power of phenol derivatives. II. Strength in the presence of proteins.**—*J. Lab. clin. Med.*, xx, 9, pp. 950–953, 1935.

Three phenol derivatives, viz., n-hexylresorcinol, chlorothymol, and thymol, were compared with iodine, sodium hypochlorite and thiosulphate, salicylic and benzoic acids for their toxicity to *Monilia* [*Candida*] *tropicalis* in the presence of proteins, represented by hide dust, vesicle fluid, and blood serum [*R.A.M.*, xiv, p. 584].

The strong fungicidal action of iodine was greatly reduced in the protein suspensions, the effect of which on n-hexylresorcinol was similar but relatively less powerful; saturated solutions of chlorothymol, benzoic and salicylic acids, and sodium thiosulphate were entirely inactive in the presence of proteins and thymol was toxic only in the hide dust suspension, whereas sodium hypochlorite maintained its killing capacity at high concentrations (1 in 750 in hide dust and 1 in 500 in the two other proteins used).

Preliminary results with some of the higher phenol derivatives suggest possibilities of an extended application for fungicidal purposes.

Mercer (S. T.) & Farber (G. J.). **An epidemic of ringworm due to Epidermophyton floccosum (inguinale).**—*Arch. Derm. Syph., Chicago*, xxvii, 1, pp. 62–68, 1935.

Details are given of an epidemic of crural ringworm (*Epidermophyton floccosum*) [*R.A.M.*, xiv, p. 510] involving 52 members of the crew of a New York passenger liner. Infection was of exceptional virulence, causing generalized lesions in five men and more or less extensive eruptions in others. On Sabouraud's maltose agar the colonies of the fungus consisted of a flattened cone with an irregularly cupped, eccentric apex and radial folds extending to the fringed borders and a powdery, greenish-yellow surface. Numerous oval or clavate, septate macroconidia (fuseaux) developed singly or in clusters, accompanied in some cultures by chlamydospores.

Magalhães (O. de). **Ensaios de mycologia.** [Mycological studies.]—*Mem. Inst. Osw. Cruz*, xxx, 1, pp. 1–55, 48 pl. (3 col.), 1935.

A full account is given of the author's studies on the 13 fungi associated with 60 cases of human diseases in Minas Geraes, Brazil. Five fresh cases of *Coccidioides immitis* [*R.A.M.*, xiv, p. 631] were investigated. A 21-year-old female patient suffered from facial lesions due to *Rhinocladium* [*Sporotrichum*] *beurmanni* [ibid., xiv, p. 632]. Kaufmann-Wolf's *Trichophyton* [*Epidermophyton*] and four forms differentiated by Ota are regarded as variants of *T. interdigitale* [*T. mentagrophytes*: ibid., xiv, p. 101 *et passim*], while Kambayashi's *Microsporon japonicum* [ibid., xii, p. 290] would appear to be identical with Ota's *M. ferrugineum* [ibid., xiii, p. 768]. A table is given (pp. 8–35) showing the date of publication, author, citation of the original description, and in some cases synonymy, of 175 ringworm fungi. In conclusion descriptions and extensive observations are given on the morphological, cultural, and pathogenic characters of two new species [figures of which are also included but no Latin diagnoses], viz., *T. cameliae* isolated

from Dutch cattle, and *M.* (*Sabouraudites*) *paraferrugineum* from a female infant.

Shaw (R. M.) & MacGregor (J. W.). **Maduromycosis : with the report of a case due to Monosporium apiospermum.**—*Canad. med. Ass. J.*, xxxiii, 1, pp. 23–28, 3 figs., 1935.

Following an introductory summary of the history and etiology of maduromycosis a full clinical description is given of a case of this disease, believed to be the first in Canada, in a 42-year-old farmer. The fungus isolated from the left leg was identified as *Monosporium* [*Scedosporium*] *apiospermum* [*R.A.M.*, xiv, p. 637 and next abstract]. Cultural and morphological details of the organism are given.

Dowding (Eleanor S.). **Monosporium apiospermum, a fungus causing Madura foot in Canada.**—*Canad. med. Ass. J.*, xxxiii, 1, pp. 28–32, 9 figs., 1935.

Monosporium [*Scedosporium*] *apiospermum*, isolated from a case of maduromycosis in Canada [see preceding abstract], was grown on glucose agar and on Sabouraud's medium with European cultures of the same fungus for comparison. In addition to features previously described [which are summarized], the following observations were made. The cultures darken from white to cinnamon-drab. Unlike the United States strains, the experimental material produced no sclerotia but frequently exhibited a growth of short, dark brown aerial hyphae. The mycelium is characterized by terminal and intercalary swellings and 'racquet hyphae'. The sterigmata sometimes occur on the conidiophores in whorls of two to five. Normally the spores are borne singly, but they may collect in groups when several in succession are produced by a sterigma.

A fungus of the *Scedosporium* type, isolated from a potato tuber, is stated to have been identified by G. R. Bisby as a species of *Geomyces*.

Redaelli (P.) & Ciferri (R.). **Una possibile nuova specie del genere Histoplasma : H. pyriformis (Moore) Cif. et Red.** [A possible new species of the genus *Histoplasma*: *H. pyriformis* (Moore) Cif. & Red.]—*Boll. Soc. ital. Biol. sper.*, x, 7, pp. 567–570, 1935.

According to a private communication from F. D. Weidman, of the University of Philadelphia, Moore's reputed new species of *Posadasia*, *P. pyriformis* [*R.A.M.*, xiv, p. 582], was isolated from the case described by Hansmann and Schenken as due to an undetermined species of *Sepedonium* [ibid., xiv, p. 235]. Attention is drawn to the very close resemblances between the organism in question and the type species of *Histoplasma*, *H. capsulatum* [ibid., xiv, p. 631], and in the writers' opinion the former should in fact be transferred to *Histoplasma* as *H. pyriformis* (Moore) Cif. et Red. n.comb. with *P. pyriformis* Moore and *S.* sp. Hansmann and Schenken as synonyms.

[An expanded version of this paper is given by Ciferri (R.) and Redaelli (P.) in 'Une quatrième espèce du genre Histoplasma'.—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 7, pp. 245–252, 1935.]

Van Beyma Thoe Kingma (F. M.). **Ueber Cephalosporium serrae Maffei und Cephalosporium stühmeri Schmidt et van Beyma, zwei gute Arten der Gattung Cephalosporium.** [On *Cephalosporium serrae* Maffei and *Cephalosporium stühmeri* Schmidt & van Beyma, two good species of the genus *Cephalosporium*.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxxxiv, 3–4, pp. 187–188, 1935.

The suggestion having been made by M. Focosi [*R.A.M.*, xiv, p. 36] that *Cephalosporium stühmeri* Schmidt & van Beyma is identical with *C. serrae* Maffei, the writer gives comparative morphological and cultural particulars clearly showing the differences between the two species. These include completely divergent types of colony growth and conidial dimensions besides the formation by *C. serrae* of brown chlamydospores which are absent in *C. stühmeri*.

Vernon (T. R.). **Studies on the mycological problems of dairying. I. The surface moulding of butter. II. The internal and subsurface discolorations of butter.**—*J. Dairy Res.*, vi, 2, pp. 154–174, 1 pl., 6 graphs, 1935.

The following fungi were obtained in over 2,000 isolations from definite superficial discolorations on samples of the butter consignments arriving at the Port of London from various countries, chiefly New Zealand, Australia, Denmark, Central Europe, Russia, South Africa, and the Argentine: five strains of *Cladosporium herbarum*, nine forms of *Penicillium*, three representatives of the *Aspergillus glaucus* group, *Alternaria* sp., *Stemphylium* sp., *Fusarium* spp. (including *F. culmorum*), and eight forms of *Phoma* [*R.A.M.*, xiii, p. 443; xiv, pp. 237, 633]. The first five of these were further isolated repeatedly from spots on wood and parchment, the former also occasionally bearing small patches of *Phoma* pycnidia. *P. alternariaceum*, only once isolated from butter, was three times cultured from discoloured wood, the greenish spots on which were also found to be associated with contamination by *Trichoderma lignorum*. Other occasional agents of superficial infection on butter included *Mucor*, *Verticillium*, *Gliocladium*, *Stysanus*, and *Acrostalagmus* spp., *Oospora lactis*, and *Trichothecium roseum*.

C. herbarum was consistently isolated from bluish-black spots of variable size and shape, *Phoma* and occasionally *Alternaria* from a large, spreading, muddy-brown blemish, *Penicillium* or members of the *Aspergillus glaucus* group from green surface growths, *Stemphylium* sp. from small, black spots, and *F. culmorum* from an extensive bright reddish-pink area in New Zealand and Australian samples. A hitherto unidentified organism with a brownish mycelium, exuding a vivid yellowish-brown pigment into the medium, was isolated from a fairly common orange-yellow discoloration of considerable extent. The fungi were experimentally shown to be capable of reproducing the conditions with which they were associated.

Fungal infection of butter is promoted by humid conditions and high temperatures. Butter inoculated with spores of the above-mentioned fungi was stored at 15° to 18° F. for varying periods from three months to over two years without developing any trace of discoloration, a result that may be generally verified in ordinary commercial practice.

From the blue-black subsurface and internal discolorations of unsalted or lightly salted samples six strains of *C. herbarum* were isolated and used in inoculation experiments with positive results. The colour and extent of mycelial growth varied considerably, being very sparse and intensely dark olive-green in a heavily sporing strain, cream-coloured and luxuriant in two others producing scanty spores. Four of the strains survived 3½ months' exposure to a temperature of 20° to 24°, but none withstood the normal cold store temperature of 15° to 18°.

NEILL (J. C.). **Prevention of mould-growth on box-timber.**—*N.Z. J. Agric.*, li, 1, pp. 22–26, 2 figs., 1935.

The results of the experiments briefly reported in this paper showed that dipping white pine (*Podocarpus dacrydioides*) boards, destined for making butter-boxes, in a 0·1 per cent. solution of shirlan WS [*R.A.M.*, xiii, p. 791] for ten minutes at about 56° F., rendered the boxes extremely resistant to the development on them of the more common box mould fungi with which the wood was inoculated, namely, *Cladosporium herbarum*, *Alternaria* sp., *Penicillium expansum*, *P. puberulum* [cf. ibid., xiii, p. 514 and preceding abstract] and *Pullularia pullulans* [ibid., ix, p. 77; xii, p. 605]. It is pointed out, however, that complete immunity from the establishment of the moulds on the treated wood could not be obtained even by steeping the wood up to 60 minutes in a 1 per cent. solution of shirlan WS.

STUART (L. S.). **The production of lipolytic and depilating enzymes by the Aspergillus flavus-oryzae group.**—*J. Amer. Leath. Chem. Ass.*, xxx, 6, pp. 315–321, 1935.

Nine of 36 strains of the *Aspergillus flavus-oryzae* group (supplied by C. Thom) yielded enzymes capable of completely loosening the hair from salt-cured, soaked calfskin [cf. *R.A.M.*, vii, p. 385], while a further six exercised a similar but slighter effect. No correlation was detected between the lipolytic and depilatory properties of the various strains, all of which showed a certain capacity, varying widely in individual cases, for lipase production [ibid., xi, p. 636; xii, p. 47]. Calculated on a dry weight basis, however, the most actively lipolytic strain produced only 0·0005 Willstätter lipase units per mg. as compared with 0·0027 for the same amount of pancreatic tissue.

ARMAND (L.). **Le mildiou de la laine.** [Wool mildew.]—*Rev. gén. Teint.*, xii, 9, pp. 675, 677, 679; 10, pp. 751, 753, 755; 11, pp. 831, 833, 835; 12, pp. 917, 919, 921, 923, 1934; xiii, 1, pp. 23, 25, 27, 1935.

A detailed account is given of the writer's two years' researches in French factories on the effect of dyes on the development of mildew in wool [*R.A.M.*, xiv, p. 585]. None of the substances tested was found to possess antiseptic properties, or at any rate not in a sufficient degree to render it commercially interesting. Only when the dye molecule contained a large number of certain electro-negative groups, especially the halogens (iodine, bromine, and chlorine), the nitrate groups, and the carboxyl radicals, was there any indication of a retardatory action on

the moulds concerned, the decisive factor in the growth of which is the presence in the wool of the degradation products arising from the albuminoid substances composing the fibres. These may best be eliminated by chromatation, while a certain protective value is also conferred by the admixture of copper sulphate, chromium fluoride, or formol with the dyes. On the other hand, mildew is favoured by all treatments tending to break down the keratin molecule in the wool, and more especially by the alkaline processes used in vat-dyeing.

Babel (A.). **Neuere Versuche zur Lein-Beizung.** [Recent experiments in Flax disinfection.]—*Nachr. SchädlBekämpf., Leverkusen,* x, 2, pp. 70–73, 1935. [English and French summaries on pp. 101–102 and 104.]

Recent investigations at the Fibre Research Institute, Sorau, Niederlausitz [Saxony] are stated to have shown that the most important seed-borne diseases of flax are wilt (*Fusarium lini*) [*R.A.M.*, xiv, p. 634] and anthracnose (*Colletotrichum lini*) [ibid., xiii, p. 390], the latter apparently sparing none of the known varieties and occurring to the extent of 2 to 20 per cent. and upwards in the seed from all sources examined. Promising results in the control of these fungi have been obtained by dusting the seed with ceresan [ibid., x, p. 597; xi, p. 182], which reduced the number of diseased plants from 493 out of a total of 600 to 44 out of 500, besides increasing germination by up to 13 per cent.

Smith (K. M.). **Some diseases of ornamental plants caused by the virus of Tomato spotted wilt.**—*J. R. hort. Soc.*, lx, 7, pp. 304–310, 5 pl., 1935.

The author calls attention to the damage done to ornamental plants by the tomato spotted wilt virus [*R.A.M.*, xiv, p. 725] and to its further potentialities for harm, owing to the very wide range of host plants susceptible to it, and gives an annotated list, admittedly incomplete, of diseases caused by the virus in ornamental plants. Besides a number of species already noticed from time to time in this *Review*, the symptoms caused by it are also described on *Salpiglossis* sp., stocks (*Matthiola* sp.), cauliflowers, *Zinnia* sp., chrysanthemums, and *Calendula*. On the Solanaceous hosts (apart from tomato) the most common symptom is the development of ring- or wave-like markings; on *Matthiola* the disease is severe and is characterized by crinkling and yellowing of the leaves; while other important hosts are chrysanthemum (which becomes stunted, the young leaves twisted and pallid, with some mottling and brown spotting of leaves and stems) and calceolaria (characterized by large, pale, irregular blotches on the leaves). Possible measures of control are briefly discussed, based on the destruction of the vector, *Thrips tabaci*, the removal of diseased plants, and the segregation of tomatoes from susceptible ornamentals.

Massey (L. M.) & Jenkins (Anna E.). **Scab of Violet caused by Sphaceloma.**—*Mem. Cornell agric. Exp. Sta.* 176, 9 pp., 4 pl. (1 col.), 1935.

The results of further studies of the disease of cultivated violets

(*Viola odorata*) briefly described from the United States in a previous communication [*R.A.M.*, xii, p. 449] showed that the trouble is distributed and highly destructive in several of the eastern and south-eastern States, and that it has also been recorded in 1934 by T. H. Harrison in a garden at Richmond, New South Wales. The disease is known to affect the Mrs. David Lloyd George, Freys Fragrant, Princess Mary, Double Russian, Governor Herrick, Rosina, and Princess of Wales horticultural varieties, the three first named being highly susceptible; it has also been found occurring naturally on several North American wild species of the violet, and in one locality in New Jersey on pansies (*V. tricolor*).

In addition to the symptoms already described [loc. cit.], the disease may cause circular to irregular lesions, usually not over 1·5 mm. in diameter, on the inflorescence, capsules, and sepals.

Morphological and cultural studies of the causal fungus indicated that it is an apparently hitherto undescribed species of *Sphaceloma*, which is named *S. violae* Jenkins, English and Latin diagnoses being appended. The acervuli are pulvinate (often about 18 mm. in diameter) or effuse; the conidiophores are at first hyaline, slightly coloured later, pointed or obtuse, 0- to 1-septate, and 9 to 12 by 2 to 4 μ; the conidia are 0- to 2-septate, usually hyaline, and 2 to 5 by 3 to 15 μ; and the microconidia are minute, spherical, often agglomerated on the surface of the lesion. In pure culture the optimum temperature for growth and sporulation was found to be from 21° to 26° C.

The best field control of the disease so far obtained was by spraying with 4 4 50 Bordeaux mixture at intervals of ten days to two weeks.

Tasugi (H.) & Ikeno (S.). **On the intracellular bodies associated with the mosaic disease of the Lily. (Preliminary report.)**—*Ann. phytopath. Soc. Japan*, v, 1, pp. 30–43, 7 figs., 1935. [Japanese, with English summary.]

In mosaic leaves of *Lilium speciosum* f. *rubrum* [*R.A.M.*, xiv, p. 634] the living cells showed the presence of vacuolate, round to ellipsoid, intracellular bodies which measured 8·9 to 68·6 by 6·9 to 34·3 μ and were in many cases larger than the host nuclei. In seriously affected plants they were abundantly present in the epidermal cells of the leaves, but in the early stages of the disease they were absent or sparsely distributed, in close contact with the host nuclei, round, without vacuoles, and resembled aggregates of particles. They withstood treatment with 15 per cent. sulphuric acid for 5 minutes, but though insoluble in alcohol, ether, or chloroform they dissolved rapidly in N/5 caustic soda solution. The P_H value of these bodies and the host nuclei lay between 4·0 and 4·8, approximately.

Pasinetti (L.) & Buzzati-Traverso (A.). **Su alcune forme di cancrena delle Cactacee dovute a nuovi micromiceti e ad un batterio.** [On certain forms of gangrene in Cactaceae caused by new micromycetes and by a bacterium.]—*Nuovo G. bot. ital.*, N.S., xlii, 1, pp. 89–123, 4 pl., 1935.

A morphological and cultural account [with Latin diagnoses] is given of five fungal and one bacterial species, which were isolated from

rotting tissues of certain cultivated Cactaceae in the Italian Riviera and are considered to be new to science, namely: *Fusarium cactacearum* from a basal dry rot of *Thelocactus nidulans*, and *F. cacti maxonii* from a similar rot of *Cactus maxonii*; *Sporotrichum cactorum* and *S. traversianum* from soft, black medullary rots of *Cereus peruvianus* and *Neomamillaria gülzowiana*, respectively; both kinds of rot progressed from the top to the base of the affected plants; *Monosporium cactacearum* from a wet, light brown medullary rot of *Coryphantha* [*Mamillaria*] *valida*; and *Bacterium cactivorum* from a wet, black rot progressing from the base to the top of *Cephalocereus* [*Cereus*] *senilis*. Inoculation experiments showed that both species of *Sporotrichum* and *M. cactacearum* are aggressive parasites, capable of penetrating through the uninjured cuticle of the host, while the two *Fusarium* and the *Bacterium* species are only wound parasites.

Verona (O.) & Ceccarelli (A.). **Su di una tracheomicosi dell' Amaranto (Amaranthus tricolor L.) prodotto da una specie di Fusarium e da Verticillium amaranti n.sp. e, in genere, sulla biologia di alcuni Verticillium patogeni.** [On a tracheomycosis of the Amaranth (*Amaranthus tricolor* L.) produced by a species of *Fusarium* and by *Verticillium amaranti* n.sp., and on the biology of some pathogenic species of *Verticillium* in general.]—*Phytopath. Z.*, viii, 4, pp. 373–400, 8 figs., 5 graphs, 1935.

A comprehensive, tabulated account, followed by a bibliography of 60 titles, is given of the writers' studies on a typical tracheomycosis of *Amaranthus tricolor* at Bagni di Casciana, some 30 km. from Pisa, associated with an undetermined *Fusarium* of the *vasinfectum* group and a new species of *Verticillium*, *V. amaranti* [a Latin diagnosis of which is given]. The latter forms on bean-saccharose agar colonies, which are white at first, turning brownish-black, and assuming a crustaceous consistency. The bi- to tri-, rarely non-verticillate conidiophores measure 150 to 180 by 2 to 3 μ, the verticils consisting of three to four branchlets, 24 to 32 μ long, at the apices of which are borne heads of ellipsoid conidia, 4·8 to 6·4 by 3 to 3·2 μ; the catenulate or conglobate, olivaceous to black chlamydospores, 9·6 by 6·4 μ, form pseudosclerotia. In inoculation experiments with the *Fusarium* and *V. amaranti* on *A. tricolor* and *Sempervivum tectorum*, each fungus gave positive results on each host.

Nitrites were produced on a medium in which potassium nitrate was the source of nitrogen by *V. amaranti*, *V. albo-atrum*, *V. dahliae*, and *V. tracheiphilum* [*R.A.M.*, x, p. 758], and the first named further elaborated a thermostable substance inhibitory to the germination of wheat, lucerne, clover, and *Amaranthus* seeds placed in filtrates of the cultures. The optimum hydrogen-ion concentration for *V. albo-atrum* was found to be P_H 8·5, for *V. dahliae* 4·9, for *V. tracheiphilum* 5·6, and for *V. amaranti* 5·0. All four species made the best growth at 24° to 26° C., readily assimilated peptone, and utilized glucose as a source of carbon, while their growth was inhibited by malachite green and brilliant green [ibid., xiv, p. 583] at concentrations between 1 in 200,000 and 1 in 500,000.

Riker (A. J.), Jones (F. R.), & Davis (Marguerite C.). **Bacterial leaf spot of Alfalfa.**—*J. agric. Res.*, li, 2, pp. 177–182, 1 fig., 1935.

A brief account is given of a bacterial leaf spot of lucerne, which was first noticed in 1930 in experimental rows in two places at Madison, Wisconsin; it again occurred in the same places in 1931, but it was never found in lucerne fields. The first symptom of the disease is the appearance on the leaves of very small, water-soaked spots which may coalesce as they increase in size, especially along the midrib and at the ends of the leaflets, forming areas of dead tissue which soon dries. In spots attaining 2 to 3 mm. in diameter the centre is often yellow with a dark brown border surrounded by a straw-coloured halo. Stem lesions were not observed in nature, but developed in artificially inoculated plants. In later stages the spot is strongly reminiscent of certain spots caused by fungi, to which the disease may have been attributed many times in the past.

Isolations from diseased tissues yielded an apparently undescribed bacterium, which is named *Phytomonas alfalfae* (or *Pseudomonas alfalfae* and *Bacterium alfalfae* according to other systems of classification). It is an aerobic, motile, Gram-negative, non acid-fast, apparently non-sporulating and non capsule-forming rod, ranging from 0·93 to 4·56 by 0·28 to 0·77 μ (average 2·14 by 0·45 μ) in diameter. On nutrient agar it forms circular, convex, smooth, white to pale yellow colonies with smooth margins. It liquefies gelatine and hydrolyses starch, forms ammonia slowly in a nitrate medium, and clears litmus milk with digestion of casein. Its temperature relations are: minimum 4°, maximum about 36°, and optimum between 24° and 32° C.

Flachs (K.). **Einige weniger bekannte Gräserkrankheiten.** [Some lesser known grass diseases.]—*Nachr. SchädlBekämpf., Leverkusen*, x, 2, pp. 57–62, 4 figs., 1935. [English and French summaries on pp. 101, 103.]

Semi-popular notes are given on the grass diseases caused in Germany by *Aplanobacter* [*Bacterium*] *rathayi* [*R.A.M.*, xiv, p. 514], attacking chiefly *Dactylis glomerata* but occasionally found on rye and *Cynodon dactylon*; *Sclerotium rhizodes*, believed to be the agent of the so-called 'string of pearls' disease on a large number of species; *Epichloe typhina* [ibid., xiii, p. 706] on *Phleum* [*pratense*], *D.* [*glomerata*], *Agrostis vulgaris*, and other hosts; and the Myxomycete, *Spumaria alba* [*Mucilago spongiosa*: ibid., vi, p. 765], which during protracted wet periods forms on grasses and other plants. The distribution of the diseases in other European countries is indicated.

Ballard (W. S.) & Lindner (R. C.). **Studies of the little-leaf disease in California.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 1–10, 1935.

An account is given of observations (dating from 1924 in the case of the senior author) on the environmental relations and treatment of little leaf of fruit trees and vines in California [*R.A.M.*, xiv, p. 642 and next abstract].

In the spring of 1925 a block of eight-year-old Malaga grapes growing in a 'corral spot' (a plot of ground formerly occupied by livestock),

found to be severely affected by the disorder, were cut off and regrafted with scions from healthy vines. This treatment proving ineffectual, 35 of the diseased vines were transferred to a fresh locality in 1927, whereupon prompt recovery took place. In the writers' opinion the so-called 'corral spot sickness' is identical with little leaf. In 1934 the following percentages of disease were recorded on various fruits planted in a corral spot in 1931: Kelsey Japan plum 100, seedling pecan [*Carya pecan*] 100, Muir peach 92, Yellow Egg plum 75, Early Harvest apple 50, Payne's seedling walnut 25, and Malaga grape 23. These figures afford a general idea of the susceptibility of the experimental fruits and nuts to little leaf, besides showing the rapid and extensive progress of the disturbance in 'corral spot' plantings.

In an experiment carried out in 1934 cuttings from badly diseased Alicante Bouschet vines were planted in coarse sand and supplied with a certain amount of zinc from the galvanized pipe-line used in watering, with the result that the later foliage was free from little leaf.

In 1932 zinc sulphate and other materials were applied to the soil surrounding vines both in solutions and as dry salts with conflicting results. In 1933 early spring treatment of vines in sandy loam soil with 10 lb. zinc sulphate proved effective by the following June, while Becky Smith plums and old vines treated about the same time with up to 15 lb. zinc sulphate showed a marked improvement in 1934. Kelsey plums on heavy orchard soil were severely damaged by soil treatments with zinc sulphate (10, 15, or 20 lb.) applied on 30th March, 1934, indicating that this method of control should be confined to the dormant season. Striking results have been obtained by the injection of zinc sulphate into vines through holes bored in the trunk, but this method is slow, costly, of doubtful permanence, and liable to promote wood rots. In 1934 the condition of little leaf vines was greatly improved by spraying with a mixture of 10 lb. of zinc oxide or zinc sulphide plus 6 oz. zinc sulphate and an appropriate quantity of casein spreader in 50 galls. water, the object of this combination being to reduce the burning injury apt to accompany zinc sulphate alone without sacrificing the rapid efficacy of the compound. The best results on pecans were given by a zinc-ammonia solution, which was in fact generally promising apart from a tendency to damage the leaves under humid conditions.

The results of these investigations are thought to indicate that little leaf, rosette, and allied disturbances are caused by zinc deficiency, but whether the action of the zinc applied in the various treatments is direct or indirect must remain uncertain pending the growth of the susceptible plants in a zinc-free medium.

Chandler (W. H.), Hoagland (D. R.), & Hibbard (P. L.). **Little-leaf or rosette of fruit trees, IV.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 11–19, 3 figs., 1935.

In nearly all Californian soils the fixing power for zinc has been found to be so high that soil treatments against little leaf with zinc compounds [*R.A.M.*, xiv, p. 176 and preceding abstract] are unduly expensive and their results uncertain, since a high fixing power not only necessitates a heavy increase in the amount of zinc required for curative purposes but also curtails the duration of its beneficial action. These disadvan-

tages may be counteracted by the admixture with the zinc sulphate of large quantities of ferrous sulphate. Treatment with 35 to 100 lb. impure ferrous sulphate containing zinc equivalent to 2 to 6 lb. zinc sulphate kept trees free from little leaf more than twice as long as the application of 5 to 25 lb. zinc sulphate alone.

The spraying of apricot, peach, and plum trees in the spring and early summer with a mixture of 10 lb. zinc sulphate and 5 lb. lime in 100 galls. water gave very satisfactory results, especially in the case of the first-named, whereas walnuts failed to respond and vines only benefited temporarily. In none of these trees were the effects of the treatment as pronounced as in citrus. Where the little leaf symptoms are restricted to the spring growth and do not involve late summer mottling zinc sulphate (10 to 32 lb. in 100 galls. with or without lime) may be applied to mature foliage in the autumn with satisfactory results. Peach, apricot, plum, and apple trees all put out healthy leaves in the spring following this treatment. Applications of zinc sulphate at high concentrations during the dormant season preserved even the most severely affected trees from little leaf until midsummer or later.

Good control of severe little leaf in vines was secured by brushing with a solution of 2 lb. zinc sulphate in 1 gall. water immediately after pruning, the wounds made by which apparently facilitate absorption of the zinc; in trees this treatment was less efficacious. Vines, apples, stone fruit, and walnuts reacted favourably to the insertion of zinc-coated nails or No. 2 diamond-shaped glazier's points. The response of citrus trees to the latter treatment was very slow when made at all, but favourable results were obtained with *Juglans hindsii*, fig, pecan [*Carya pecan*], Carolina poplar [*Populus canadensis*], *Melia* [*azedarach*], and *Ligustrum* [*? ovalifolium*]. The insertion of No. 0 glazier's points $\frac{1}{2}$ in. apart injured the bark of walnut trees, while peaches suffered severely from similar treatment ($\frac{1}{8}$ to $\frac{1}{2}$ in.) with zinc pieces or zinc-coated nails. The other fruit trees used in the tests were not adversely affected, and by widening the spaces between the points to 1 in. damage even to the sensitive peaches and walnuts was obviated. Further experiments are necessary to determine the risks of injury from this method of treatment and the duration of its therapeutic action.

Crosby (C. R.), Mills (W. D.), & Blauvelt (W. E.). **Protecting orchard crops from diseases and insects in western New York.**—*Ext. Bull. Cornell agric. Exp. Sta.* 313, 92 pp., 18 figs., 1935.

This bulletin represents an attempt to supply fruit growers of western New York with information concerning the latest developments in the practical control of fungal diseases and insect pests of the apple, pear, cherry, peach, plum, and quince. Spray calendars for each host are given and each of the diseases and pests is dealt with separately in popular terms. In a concluding section notes are given concerning the spray materials used.

Crosby (C. R.) & Mills (W. D.). **Protecting orchard crops from diseases and insects in the Hudson Valley.**—*Ext. Bull. Cornell agric. Exp. Sta.* 314, 89 pp., 16 figs., 1935.

This is a slightly modified version (omitting quince diseases) of the

Extension Bulletin 313 [see preceding abstract], calculated to apply to conditions obtaining in the Hudson Valley, New York State.

Goodwin (W.), Pizer (N. H.), Salmon (E. S.), & Ware (W. M.). **The control of Apple scab: Allington Pippin, and Newton Wonder, 1934.** —*J. S.-E. agric. Coll., Wye*, xxxvi, pp. 55–61, 1 fig., 1935.

In further comparative spraying tests against apple scab [*Venturia inaequalis*: *R.A.M.*, xiii, p. 779] conducted in Kent in 1934, Allington Pippin trees given two pre- and two post-blossom applications of home-made Bordeaux mixture (8–12–100) and cotton-seed oil Bordeaux emulsion prepared as in the previous year's test [loc. cit.] showed, respectively, 2·3 and 3·2 per cent. scab-affected apples, as compared with 2·7 and 6·9 per cent. for Newton Wonder trees given the same treatments. In the unsprayed control plots the former variety averaged 31·8 and the latter 37·7 per cent. scabbed fruits. As infection was slight and occurred late it was not possible to ascertain any difference in the fungicidal efficiency of the two treatments.

Austin (M. D.), Jary (S. G.), & Martin (H.). **Bordeaux mixture—nicotine combinations against aphis and Apple scab.**—*J. S.-E. agric. Coll., Wye*, xxxvi, pp. 95–99, 1935.

In spraying tests carried out in 1933 and 1934 apple trees given two pre-blossom applications of the combined fungicidal-insecticidal washes, Bordeaux-sulphite lye-nicotine and cotton-seed oil-Bordeaux-nicotine [see preceding abstract], showed at the end of the second season's treatment a lower aphis (*Anuraphis roseus*) infestation than the untreated controls and trees sprayed with ordinary Bordeaux mixture plus nicotine, but a heavier one than that generally found on trees treated with tar distillate washes. Both the modified Bordeaux washes gave as good control of scab [*Venturia inaequalis*] as did ordinary Bordeaux mixture. The cotton-seed oil-Bordeaux-nicotine spray caused less injury to the fruit and foliage than ordinary Bordeaux-nicotine or Bordeaux-sulphite lye-nicotine.

Hall (J. W.). **Special sulphur dust versus lime sulphur for Apple scab control.**—*Scot. J. Agric.*, xviii, 3, pp. 254–259, 1935.

In spraying tests [which are described, and the results of which are tabulated] conducted at two centres in Scotland from 1932 to 1934, lime-sulphur spray with casein added and a proprietary sulphur dust considerably reduced the incidence of apple scab [*Venturia inaequalis*], but no conclusions have as yet been reached as to the relative merits of the two treatments.

Carne (W. M.) & Martin (D.). **Apple investigations in Tasmania: miscellaneous notes.**—*J. Coun. sci. industr. Res. Aust.*, viii, 2, pp. 71–75, 1935.

Continuing the account of their investigations into non-parasitic apple diseases [*R.A.M.*, xiv, p. 242], the authors refer to the confusion that exists in the naming of these disorders, especially the cool storage scalds [see next abstracts], and point out that superficial scald and deep or soft scald [ibid., xiv, pp. 41, 42] are readily distinguishable. There

is no evidence that these conditions [which are described] as they occur in ordinary cool storage are related. Neither ever passes into the other. Confusion, however, has probably arisen when troubles occurring during storage experiments with abnormal atmospheres have been wrongly identified as 'scald'. This was confirmed by an experiment in which Sturmer apples stored for 10 weeks at 34° F. in sealed containers (carbon dioxide being allowed to accumulate to pre-determined amounts maintained within narrow limits by blowing in a calculated amount of air daily), developed in addition to brown heart a disorder that was apparently identical with Kidd's and West's deep scald [ibid., iii, p. 145] and Thomas's invasive alcohol poisoning [ibid., x, p. 606]. Every reduction of oxygen was accompanied by an increase in the severity of the condition, which developed independently of the brown heart. Other Sturmer apples in similar containers kept at room temperature did not develop either condition in two months, though the amount of carbon dioxide present rose to 38 per cent. in 30 days. The apples with alcohol poisoning and those kept at room temperature developed a strong alcoholic flavour. That Kidd's and West's deep scald is not the deep scald of ordinary stores was recognized but not emphasized by Thomas, and has been overlooked by other workers.

The paper concludes with a table showing the differences observed by the authors between superficial scald, deep scald, and alcohol poisoning.

Plagge (H. H.) & Maney (T. J.). **Soggy breakdown of Winter Banana Apples.**—*Phytopathology*, xxv, 7, pp. 730–731, 2 figs., 1935.

From a recent comparison of the soggy breakdown occurring in Winter Banana apples stored in Iowa at a low temperature (31° F.) [*R.A.M.*, xiv, p. 592] with the condition known as soft scald [cf. preceding and next abstracts] in the Wealthy, Golden Delicious, and other varieties, the writers conclude that these two disorders are identical.

Allen (F. W.) & McKinnon (L. R.) **Storage of Yellow Newtown Apples in chambers supplied with artificial atmospheres.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 146–152, 1935.

This is a report on the first season's work on the control of scald and internal browning in Californian Yellow Newtown apples [see preceding abstracts] by storing the fruit at 40° to 42° F. in an atmosphere containing 10 per cent. each of carbon dioxide and oxygen. Under these optimum conditions, determined as the result of experiment, the apples kept firm and green and the flesh moderately crisp and juicy, though the flavour was slightly impaired. The use of oiled paper, previously shown to have little value in reducing scald in this variety, did not appear appreciably to improve the condition of the fruit.

Askew (H. O.). **The boron status of fruit and leaves in relation to 'internal cork' of apples in the Nelson district.**—*N.Z. J. Sci. Tech.*, xvii, 1, pp. 388–391, 1935.

The boron content of Jonathan, Dunn's Favourite, and Dougherty apples on soils in certain localities of the Nelson district, New Zealand, where 'internal cork' or 'corky-pit' is prevalent [*R.A.M.*, xiv, p. 592],

was found to be only about one-third as high as that of healthy fruit on an unaffected type of soil. The percentage of boron found in the different samples was inversely proportional to the severity of the disturbance. Boron deficiency is thought to be undoubtedly the primary cause of 'internal cork' on the soils in question.

Crowell (I. H.). **Compilation of reports on the relative susceptibility of orchard varieties of Apples to the Cedar Apple rust disease.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 261–272, 1935.

The scattered reports on the varietal reaction of apples to cedar apple rust (*Gymnosporangium juniperi-virginianae*) [*R.A.M.*, xiv, p. 684] in 36 States of the American Union have been collected and are here presented in the form of a tabular list of nearly 200 varieties, the degree of susceptibility of which to the disease is indicated.

Ogilvie (L.). **The fungus flora of Apple twigs and branches and its relation to Apple fruit spots. I. Review of literature and preliminary experiments.**—*J. Pomol.*, xiii, 2, pp. 140–148, 1935.

The author quotes from literature [36 titles of which are included in the bibliography appended] a number of cases in which the connexion between the fungus flora commonly occurring on the twigs and branches of apple trees in nature and fruit infection has been clearly established. A brief account is also given of his own preliminary experiments and observations in which he showed the capacity of certain apple branch and twig saprophytes (*Gloeosporium album* [*R.A.M.*, iv, p. 174], *Diaporthe perniciosa* [ibid., xiii, p. 524; xiv, p. 249], and *Alternaria*) to cause spots and rots on apples.

Liro (J. I.). **Finland: Apple powdery mildew (Podosphaera leucotricha).**—*Int. Bull. Pl. Prot.*, ix, 7, p. 151, 1935.

Powdery mildew of apples (*Podosphaera leucotricha*) [*R.A.M.*, xiv, pp. 639, 711] is stated to have been first detected in Finland in 1923, when prompt measures were adopted for its control [ibid., v, p. 190]. The disease reappeared, however, in a garden near Helsingfors in 1934, having been introduced on Swedish apple stocks in the previous year, and is considered seriously to endanger the Finnish apple-growing industry.

Wenzl (H.). **Beobachtungen über die Anfälligkeit von Birnensorten gegen die Weissfleckenkrankheit (Mycosphaerella sentina).** [Observations on the susceptibility of Pear varieties to the white spot disease (*Mycosphaerella sentina*).]—*Z. PflKrankh.*, xlv, 6–7, pp. 305–316, 1935.

The exceptionally severe outbreak of white spot of pears (*Mycosphaerella sentina*) [*R.A.M.*, xiv, p. 617] in Austria in 1934 afforded a favourable opportunity for the detailed study of varietal reaction to this disease. A table is given showing how the resistance or susceptibility of 89 varieties fluctuated according to the climatic and soil conditions of the six different nurseries included in the observations, indicating that ecological factors as well as hereditary tendencies are involved in the response of a given pear to infection by the fungus.

Of the varieties tested only Conference, Eva Baltet, Bergamotte, Fertility, and President Douard showed appreciable resistance to *M. sentina*, and of these only the two first named are resistant to scab [*Venturia pirina*], a much more serious disease than white spot in most fruit-growing districts. As in the case of *Entomosporium maculatum* [*Fabraea maculata*], the agent of leaf blight of quinces and pears [ibid., xii, pp. 181, 231], infection by *M. sentina* was found to be restricted to a comparatively narrow radius from the original site of invasion.

Brooks (F. T.) & Brenchley (G. H.). **A note on the recovery from silver-leaf disease of Plum trees on common Plum and Myrobolan stocks, respectively.**—*J. Pomol.*, xiii, 2, pp. 135–139, 1935.

The authors state that in an experiment, started in 1930 at East Malling, in which young plum trees, grafted on common plum and on myrobolan stocks, respectively, were artificially infected with *Stereum purpureum* [*R.A.M.*, xiv, p. 375], the number of recoveries from the silver leaf disease thus induced was by August, 1934, significantly higher in trees on common plum than in those on myrobolan stocks [cf., ibid., xi, p. 59]. Reference is also made to observations recorded from 1921 to 1931 in a plum stock trial at East Malling which showed a higher proportion of recoveries from silver leaf disease in trees on common plum stocks (20 out of 23) than on the myrobolan (26 out of 41).

Koch (L. W.). **Investigations on black knot of Plums and Cherries. IV. Studies in pathogenicity and pathological histology.**—*Sci. Agric.*, xv, 11, pp. 729–744, 4 pl., 1 fig., 1935. [French summary.]

In this paper, which concludes the series dealing with his studies on black knot of plums and cherries (*Dibotryon morbosum*) [*R.A.M.*, xiv, p. 593], the author gives a tabulated account of inoculation experiments carried out from 1930 to 1934, inclusive. Out of a total of 622 plum and cherry current year branches which were inoculated with suspensions of ascospores or conidia through wounds penetrating to the cambium only 19 (3 per cent.) developed black knots, and of these 16 (84 per cent.) had been inoculated during the month of May, and 3 (16 per cent.) during June. All inoculations made during the remainder of the year gave negative results. While only one knot resulted from the inoculation of branches over one year old with material from the fruiting surface of a plum knot, three knots were produced on old branches of *Prunus domestica* by 'patch grafting' on them pieces of unswollen host tissue taken from just beyond the border of knots. All the artificially produced knots became visible in the autumn of the year of infection; many produced the *Hormodendrum* stage during the autumn and perithecia during the following winter and spring, thus completing the life-cycle of the parasite within one year.

These results are considered to confirm the conclusion arrived at previously [loc. cit.] that over 95 per cent. of black knots originate on the current season's wood, and to indicate that the period during which infection can take place in nature is very limited (May and June), presumably owing to the fact that, while temperature, relative humidity, and amount and type of inoculum are undoubtedly important factors

in the epidemiology of the disease, the condition of the host is the outstanding factor which limits infection.

Histological studies of the knots at all stages of development showed that soon after the cambial region in the current year's wood is reached by the fungus, hypertrophy and hyperplasia of the host tissues set in; as soon as the medullary rays in this region are invaded, instead of forming the usual elements the cambium produces a relatively large number of parenchyma cells which are many times their normal size, as well as scalariform tracheids, frequently in contact with the mycelium. Although the fungus advances through normal xylem tissues during the dormant period of the host, it does not cause visible hypertrophy during the winter. The study also showed that the host and parasite are capable of living in intimate contact with each other for about six or seven months before pathological effects become apparent.

Recent experiments indicated that excellent control of the disease may be obtained by spraying the trees at 'full bloom' with 1 in 50 lime-sulphur, in addition to the applications previously recommended at the delayed dormant and petal stages [ibid., xii, p. 705].

Husz (B.). **Gyümölcsfapermetezési kisérletek.** [Spraying experiments on fruit trees.]—*Bull. Éc. hong. Hort.*, i, pp. 8–22, 6 figs., 1935. [English summary.]

Almost perfect control of red spot (*Polystigma*) [*rubrum*] (*Polystigmina rubra*) on three plum varieties, viz., Prune and Prune Muscat of Beszterce and French Prune of Agen, was obtained in Hungary in 1934 by four applications (on 26th March, 24th April, and 4th and 16th May) of 0·5 or 1 per cent. Bordeaux mixture [*R.A.M.*, xiii, p. 454], lime-sulphur, and a combination of lime-sulphur and calcium arsenate.

The best control of apple diseases (chiefly *Podosphaera leucotricha*) [see above, p. 771] and pests in two years' trials was given by a combination of 1 per cent. lime-sulphur with lead arsenate paste (containing 8·75 per cent. arsenic) or (for the later applications) with calcium arsenate (0·25 per cent. Arzola) [cf. ibid., ix, p. 46; xi, p. 253].

Harding (P. L.) & Haller (M. H.). **Peach storage with special reference to breakdown.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 160–163, 1935.

Physiological breakdown in stored peaches [cf. *R.A.M.*, ix, p. 789; x, p. 162], associated with a brown discoloration and mealiness of the tissues and insipidity of flavour, has been found to be most prevalent in the United States at a temperature of 40° F. At 31° to 32°, however, the fruit may be maintained in fair condition for periods of two to five weeks according to the variety, the shorter duration being indicated, for instance, for Belle, Champion, Hiley, and Carman, and the longer for New Jersey 66 and 12722, Late Crawford, and J. H. Hale.

Trotter (A.). **Deperimenti del Pesco, per parassitismo sulle radici di una nuova Monotospora.** [Peach wilt due to root infection by a new *Monotospora*.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), iv, pp. 3–11, 2 pl., 2 figs., 1935.

In 1928, twelve 7-year-old grafted peach trees in an orchard of 700

growing at Salerno on land recently reclaimed by drainage suddenly wilted; a year later 150 were affected, and by 1933 only 100 still remained alive. The disease appeared suddenly each spring, causing a general yellowing and shedding of the leaves; fruiting ceased, and the trees rapidly withered and died. Apart from these symptoms, the only visible abnormality was that the cortex of the larger roots was conspicuously cracked in all directions and showed numerous large, raised lenticels, while the surface of the smaller roots was wrinkled.

Examination of the affected roots (in 1933) showed the presence of a hyaline, branched, apparently non-septate mycelium with hyphae 1·5 to 2 μ in diameter, throughout the diseased tissues. Smooth, dark, subglobose or ovoid aleuriospores 10 by 10 μ or up to 16 to 17 by 12 to 15 μ, with a wall 1·5 to 2 μ thick, and provided with a lighter area, probably a germination pore, were irregularly arranged on the hyphae; they were occasionally sessile, but usually borne on short, simple, hyaline aleuriophores somewhat thickened at the apex. No phialids or phialospores were seen. In culture aleuriospores were produced resembling those found in nature.

The fungus is considered to be a new species of *Monotospora*, and as it is regarded as being at least partly responsible for the death of the trees, it is named (with a Latin diagnosis) *M. parasitica*.

HARRISON (T. H.). **Technical notes. Occurrence in Australia of Lambertella corni-maris von Höhnel, a brown-spored parasitic Discomycete.**—*J. Aust. Inst. agric. Sci.*, i, 2, p. 76, 1935.

The author records the occurrence in September, 1934, of apothecia of *Lambertella corni-maris* [*R.A.M.*, xiv, p. 451] on two mummified apricots at Bilpin, New South Wales.

COLBY (A. S.). **Inheritance of Gooseberry leaf infection.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 397–399, 1 graph, 1935.

The present report deals with varietal reaction to anthracnose [*Pseudopeziza ribis*] and leaf spot [*Mycosphaerella grossulariae*: *R.A.M.*, xii, p. 640] in 1,301 gooseberry seedlings arising from the selfing and crossing of nine varieties. Factors for resistance to the two diseases (which appears to rest on a multiple basis) were shown to be carried by Transparent, Rideau, and Como, while several seedlings combined relative freedom from infection with the desirable qualities of spinelessness and large fruit.

WOLF (F. A.). **The perfect stage of Cercospora rubi.**—*Mycologia*, xxvii, 4, pp. 347–356, 8 figs., 1935.

A brief account is given of the author's investigations of *Cercospora rubi* [*R.A.M.*, ix, p. 290] in North Carolina, where it is stated to be capable apparently of attacking both wild and cultivated species of *Rubus*, including raspberries, dewberries, and blackberries; it is also common and widespread in the eastern United States, where in certain years it causes severe defoliation of the hosts, especially in commercial plantings. The results of the studies showed that the conidial stage present on the leaves during summer is succeeded by a perithecial stage, the initials of which (archicarps with trichogynes) are laid down

together with spermogonia, from late August to the end of October. The hypophyllous black, spherical to flask-shaped spermogonia, 20 to 25 μ in diameter, contain myriads of rod-shaped spermatia, 2 to 3 by 1 to 1·5 μ. The perithecia matured on leaves kept out of doors throughout the winter, by late April or early May. They are sparse, hypophyllous, globose, semi-immersed but later erumpent, black, with a papilla-like ostiole, and measure only 40 to 60 μ in diameter. The asci are fasciculate clavate, with a short pedicel; paraphyses are not present. The ascospores are distichous, hyaline or sub-hyaline, curved, oblong-cylindrical, divided into two unequal cells, and 11 to 14 μ long. The perithecial stage (the genetical connexion of which with the conidial stage was proved in cultural studies) is named *Mycosphaerella dubia* [with a Latin diagnosis].

The taxonomic study of the conidial stage showed that the later species *C. septorioides* and *C. bliti* are identical with it, while *C. rubicola* and *C. garbiniana* may also prove to be further synonyms.

Luckan. **Himbeerrutenkrankheit.** [Raspberry cane disease.]—*VerbMitt. Landesverb. Sachsen Obstb., 1935*, 7, p. 105, 1935.

The increasing susceptibility to cane blight (*Didymella applanata*) of the reputedly resistant Preussen raspberry [*R.A.M.*, x, p. 804] is stated to have greatly reduced the value of this variety for cultivation in Saxony. Only raspberry stock free from this disease may be sold under the regulations of the Reich Food Board. Crosses between raspberry and blackberry have constantly yielded progeny showing resistance to *D. applanata*, and the possibility of developing a desirable raspberry by this means should be considered.

Hull (R.). **Investigation of the control of spoilage of processed fruit by Byssochlamys fulva.**—*Rep. Fruit Veg. Pres. Sta., Campden, 1933–34*, pp. 63–73, [? 1935].

To investigate the presence of *Byssochlamys fulva*, an agent of spoilage in processed fruit [*R.A.M.*, xiii, p. 711], in a given material, advantage was taken of the resistance of the ascospore stage to heat. Samples of leaves, fruit, straw, and the like were collected in plugged sterile tubes, which were filled with hot potato-sucrose agar, acidified with hydrochloric acid to P_H 3, heated in a water bath at 80° C. for 30 minutes, sloped, and incubated when set at 30°.

Positive infections were obtained from diseased and healthy strawberry leaves in April (35 and 13 per cent., respectively), from leaves and straw in July (20 and 4 per cent., respectively), from ripe berries (26 per cent.), from leaves of various soft fruits near Colchester (4 out of 150 tubes), from Kentish orchards (5 to 25 per cent.), from two factories, and from all the Gloucestershire plantations of raspberries, loganberries, black currants, gooseberries, and plums inspected.

Investigating the possibilities of control of *B. fulva* in the factory, its elimination from the field being evidently impracticable, the writer found that various powerful disinfectants were ineffectual for this purpose. It was experimentally shown that a temperature of 92° is necessary to kill the ascospores in 1½ minutes. An increase in the sucrose content of the medium up to 20 per cent. was found to render the spores

more resistant to heat, but at higher concentrations the germination rate declined. Further studies are required to determine the best means of combining a treatment destructive to *B. fulva* spores with the exigencies of the canning process.

PLAKIDAS (A. G.). **Factors responsible for the small Strawberry crop in Louisiana this year.**—*Plant Dis. Reptr*, xix, 8, pp. 132–134, 1935. [Mimeographed.]

One of the principal factors in the exceptionally low production (only 43 crates per acre) of the 1935 Louisiana strawberry crop is stated to have been the crown rot caused by *Sclerotinia sclerotiorum*, which appears to have been favoured by the long wet spells and low temperatures in February and March, while the constitution of the host was weakened by frost injury. Taking the strawberry-growing area as a whole, some 15 per cent. of the plants were more or less severely affected.

STEVENS (N. E.). **An attempted analysis of the economic effects of Cranberry diseases.**—*Plant Dis. Reptr*, xix, 8, pp. 112–128, 4 graphs, 1935. [Mimeographed.]

In this analytical study of the effects of disease on the American cranberry market from 1913 to 1933, inclusive, the writer's attention has been confined to the fruit rots and the even more important false blossom [*R.A.M.*, xii, p. 231; xiii, p. 316]. At the very conservative estimate of an average reduction from decay of 25 per cent., a loss to the consumer is indicated of over 120,000 barrels, valued at $750,000 per annum, while the loss to New Jersey alone from false blossom reached, during a 10-year period, 35,000 barrels per annum, apart from depreciation of capital value estimated at 25 per cent. The various factors involved in an inquiry of this nature are discussed under the following headings: size and quality of cranberry crop in relation to producer and consumer; and the position of (*a*) groups of growers, (*b*) the individual grower, and (*c*) the consumer.

SERRANO (F. B.). **Control of bacterial fruitlet rots of the Pineapple in the Philippines.**—*Philipp. J. Sci.*, lvii, 1, pp. 29–62, 1 pl., 1 diag., 1 graph, 1935.

Between 1927 and 1930, from 27 to 55 per cent. of the pineapple fruits grown in the Philippine Islands were attacked by bacterial fruitlet rot caused by *Phytomonas* [*Bacterium*] *ananas* or by *Erwinia* [*Bacillus*] *ananas* [*R.A.M.*, xiv, p. 456] or both, 12 per cent. being a total loss.

Infection is favoured by incomplete closing of the eyes, fewness of the shoots around the fruit, allowing it to be bent to one side and become sun-scorched, high atmospheric temperature, and low fruit acidity, of which the first two and the last may perhaps be remedied by breeding and selection, the third by shading or by growing the fruit at elevations of about 2,000 ft., and the last, again, by the application of suitable fertilizers.

Very satisfactory control resulted from spraying the young fruits while in flower with Bordeaux mixture (3–4–50 during the first month,

4–5–50 afterwards) or lime-sulphur (33° Baumé, 1 in 80 during the first month, 1 in 70 subsequently) at fortnightly intervals for three to four months.

Under Bukidnon Province conditions two applications of potassium sulphate at the rate of 500 kg. per hect., made during the tenth and thirteenth months, reduced infection by approximately 16 to 17 per cent., increased the average weight per fruit by 0·2 kg., and raised the fruit acidity from P_H 4 to 3·8. The evidence obtained strongly indicated that the increased acidity of the cell sap and firmness of the tissues induced by the potash treatment were responsible for the resistance shown.

Cristinzio (M.). **Alcune malattie crittogamiche del Nespolo del Giappone ed in particolare la 'ticchiolatura'.** [Some fungal diseases of Loquat and, in particular, scab.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), iv, pp. 25–50, 4 pl., 6 figs., 1935.

In this account of loquat diseases observed in southern Italy the author states that the serious scab disease (*Fusicladium dendriticum* var. *eriobotryae*) [*R.A.M.*, xii, p. 231] is most prevalent in compact, wet soils, hot, rainy seasons, and coastal areas. The affected trees are conspicuous by their sickly foliage; the young infected leaves are contorted, thickened, covered with black spots, and lacerated at the edges, and quickly fall; the older ones are holed and the edges torn but remain attached. The branches are also attacked and after two or three years become markedly rachitic, while the fruiting is impaired or destroyed, affected fruits being quite unsaleable. The fungus is usually confined to the epidermal cells forming a stroma 20 to 60 μ thick, which ruptures the cuticle and bears conidiophores, measuring 10 to 48 by 5 to 8 μ with conidia 16 to 30 by 5 to 7 μ.

Sphaeropsis malorum Peck [*Physalospora obtusa*: ibid., xii, p. 396; xiv, p. 371] produces over the whole leaf surface round, yellowish, later blackish, finally grey, generally confluent spots with a dark rim. On the young branches it produces depressed areas on the bark which soon cracks and turns black. The lesions become cankerous and expose the woody tissues; if they girdle the branch, the part above rapidly withers. Black, unilocular, pyriform pycnidia, 500 to 1,200 by 200 to 500 μ in diameter, are formed on the affected tissues; the pycnospores are hyaline, later yellowish, finally fuliginous, oval, elliptical or slightly bow shaped, continuous, and measure 19 to 29 by 8·5 to 12 μ. Associated with these pycnidia on the branch cankers are others, subspherical-depressed in shape, measuring 200 to 600 μ in height and containing hyaline conidia, 18·5 to 27·5 by 8 to 12 μ. This type corresponds to *Macrophoma malorum* [ibid., vi, p. 423]. Both fungi are regarded as true parasites.

Ascochyta eriobotryae [ibid., xii, p. 396] was very prevalent near Naples on the leaves of otherwise healthy but debilitated trees; heavy and repeated infections caused premature defoliation. The affected leaves bore numerous round, chestnut, later light grey, erumpent, isolated, occasionally confluent spots with a dark rim. The semi-immersed, later erumpent pycnidia measured 150 to 400 μ in height,

and the cylindrical or ellipsoidal-elongated, frequently arcuate spores, slightly constricted at the median septum, measured 8 to 12 by 2 to 3·5 μ.

Brief reference is also made to a few other loquat diseases reported by different workers, including *Bacillus amylovorus* [ibid., xiii, p. 424], *Phoma eriobotryae* [ibid., xiii, p. 175], and *Phytophthora parasitica* [f. *eriobotryae*: ibid., vii, p. 186].

Tai (F. L.) & Cheo (C. C.). **A dry rot of Pomegranate fruit caused by Zythia versoniana Sacc.**—*J. hort. Ass. China*, i, 1, pp. 203–217, 12 figs., 1934. [Received October, 1935.]

This is an expanded account of the destructive dry rot of pomegranates (*Punica granatum*) caused by *Zythia versoniana* in China [*R.A.M.*, xii, p. 641]. The pyrites-yellow pycnidia are densely aggregated, erumpent, 56 to 144 by 62 to 131 μ, and the hyaline, fusoid pycnospores measure 13 to 19 by 3 to 5 μ. The minimum, optimum, and maximum temperatures for the growth of the fungus were found to be about 12·5°, 24° to 28°, and 35° C., respectively. The dead fruits left hanging on the trees constitute an important source of primary infection since the dormant mycelium in them resumes activity in April, producing crops of fresh pycnidia. The application of Bordeaux mixture considerably reduced the incidence of infection by *Z. versoniana* in 1933. The Yushutze pomegranate has been found resistant to the dry rot, while Funpi is very susceptible.

Milanez (F. R.). **Notas sobre a galha lenhosa da Goiabeira.** [Notes on a woody gall of the Guava.]—*Rodriguésia*, i, 1, pp. 3–7, 7 pl., 1935.

A detailed account is given of the author's histological studies of large woody galls on the trunk of guava trees (*Psidium guajava*), which are stated to be common in the Minas Geraes State of Brazil. He attributes the origin of these galls to the presence in the cambium of a fungus (presumably a Phycomycete) which he was not able to identify as it could not be cultured from the material submitted to him.

Tavernetti (J. R.). **Characteristics of the resistance type soil sterilizer.**—*Agric. Engng St. Joseph, Mich.*, xvi, 7, pp. 271–274, 1 fig., 1 diag., 6 graphs, 1935.

Summing up the results of experiments conducted in California to ascertain the behaviour of the 'resistance' (electric) soil sterilizer [*R.A.M.*, xiv, p. 519] under varying conditions of soil and equipment, the writer concludes that the advantages of this method lie in the simplicity and inexpensiveness of the apparatus, its easy, rapid, and semi-automatic operation, and the uniform heating obtained. Its two serious drawbacks are the risk of electric shock (especially with the bench sterilizer, which cannot, in contrast to the box type, be enclosed) and variable electric load.

Davies (C.) & Smyth-Homewood (G. R. B.). **Investigations on machinery used in spraying. Part II. Nozzles.**—*J. S.-E. agric. Coll., Wye*, xxxvi, pp. 62–85, 4 pl., 12 figs., 2 graphs, 1935.

Using the method previously described for the accurate measurement

of a sprayed area of foliage [*R.A.M.*, xiii, p. 790], the authors carried out a series of tests [the results of which are tabulated] on apple trees 10 to 20 ft. high under commercial conditions in the field, the data obtained showing an average cover of about 78 per cent. The area covered was estimated by placing a $\frac{1}{10}$ in. mesh screen over the disk record and counting the number of squares showing any deposit. The 'spray cover efficiency' (based on area covered, atomization [graded as fine, medium, and coarse, with a maximum value of 60], and uniformity [even, fair, uneven, maximum value 100]) averaged 62 per cent. When different pressures and nozzle settings were similarly tested the cover ranged from 60 to nearly 92 per cent. In laboratory tests of different makes and patterns of nozzles it was found that the increased weight and greater back pressure which result from the use of multiple clusters of nozzles on one lance can largely be obviated by employing nozzles made of some light metal such as duralumin alloy and much shorter lances. As a pair of nozzles, side by side, moved horizontally produces a narrower, more heavily drenched bank of spray than when moved perpendicularly, it is recommended that three nozzles should be used so mounted on one lance that the orifices form an equilateral triangle.

Emphasis is laid on the importance of basing the manner in which nozzles are grouped on the lance upon the conditions contributing to the most efficient spraying; it is fallacious to assume that merely using two or more in a cluster must result in a larger area being covered in a given time.

Schädlingsbekämpfung in Frankreich. [Pest control in France.]—*Chem. Industr., Berl.*, lviii, 16, pp. 293–294, 1935.

The total loss sustained annually by French agriculture through plant diseases and pests is estimated at an average of M.1,500,000,000. In the absence of exact information only a rough estimate of the value of the annual French production of plant protectives can be made, viz., M.25,000,000 to 30,000,000, of which 60 to 70 per cent. consists of copper sulphate, 10 to 20 per cent. of arsenates, and 20 to 30 per cent. of miscellaneous substances, while imports are estimated at M.5,000,000 to M.6,000,000. In addition to smaller quantities of other preparations, 70,000 tons of copper sulphate, valued at M.20,000,000 in 1934, are used annually in French vineyards; the home manufacture of this substance has been widely extended during the last few years. Data regarding arsenates and miscellaneous substances are also given.

Reckendorfer (P.). **Zur Physikochemie der Kupferkalkbrühe (Haftfähigkeit als Quellungserscheinung).** [On the physico-chemistry of Bordeaux mixture (adhesiveness as a function of swelling).]—*Z. PflKrankh.*, xlv, 6–7, pp. 341–353, 2 graphs, 1935.

The writer describes the technique and discusses the results of his experiments to determine the 'carrier' of the property of adhesiveness in Bordeaux mixture [*R.A.M.*, xi, p. 524; xii, p. 174; xiii, p. 597], and further to define the influence on this character of the lime used in the preparation of the compound. It was found that the adhesiveness of spray materials depends on the colloidal character of the spray deposit. Irreversible colloidal deposits show a tendency after drying to be almost

or quite incapable of further swelling and consequently are not easily washed off. The dehydrated hydrogel deposit of Bordeaux mixture owes its resistance to washing off by rain solely to its physico-chemical resistance to swelling in response to atmospheric factors.

In order to compare the adhesiveness of Bordeaux mixtures (with copper-lime ratios of 1: 1, 1: 1·5, and 1: 2) the swelling capacity of their dried deposits was recorded on the rotating drum of a special apparatus which is described in detail. The adhesiveness of the mixtures was found to increase parallel with the rising lime content to reach a maximum in the region of molecular saturation (phase III_2; corresponding to a copper sulphate-lime ratio of 1: 1·5), followed by an immediate decline, the swelling of the three mixtures increasing to relative constant values of approximately 12·0, 2·1, and 5·8, respectively. after 10 hours. However, the adhesiveness of the only mixture of practical importance (1: 1, phase III_1) is quite adequate, the amount of the fungicide washed off being inappreciable from the standpoint of plant protection, yet sufficient to obviate any risk of injury to health from its consumption with the harvested product.

Wood (Jessie I.). **Estimates of crop losses from diseases in the United States.—1931, 1932, and 1933.**—*Plant Dis. Reptr Suppl.* 87, 82 pp., 1935. [Mimeographed.]

The following are some of the data on the losses due to disease among the more important American crops in 1931, 1932, and 1933 [*R.A.M.*, xi, p. 769: xiii, p. 316]. The total wheat production for the three years amounted to 892,271,000, 741,076,000, and 527,413,000 bushels, respectively, the losses from all diseases during the same period being estimated at 66,091,000, 50,629,000, and 26,174,000 bushels, respectively. The total maize production for 1931 was 2,556,863,000 bushels with an estimated loss from all diseases of 200,584,000 bushels, the corresponding figures for 1932 and 1933 being 2,906,873,000 (291,347,000) and 2,330,237,000 (234,655,000) bushels, respectively. In 1931, 1932, and 1933 the potato yields totalled, respectively, 376,248,000, 358,009,000, and 317,143,000 bushels, with estimated losses of 57,766,000, 78,189,000, and 39,794,000 bushels, respectively. Figures are given of the losses from the chief individual diseases of each crop.

Storey (H. H.). **Virus diseases of East African plants. I. Introduction.** —*E. Afr. agric. J.*, i, 1, pp. 63–68, 1935.

In this paper, designed to be the first of a series upon the virus diseases of crop plants in East Africa, the author discusses in popular terms some of the characteristic features of virus diseases and the principles of their control in agricultural crops.

Köhler (E.). **Viruskrankheiten.** [Virus diseases.] —*Kranke Pflanze*, xii, 7–8, pp. 109–112, 1935.

An account is given in semi-popular terms of some recent important discoveries in connexion with virus diseases of economic and ornamental plants, with special reference to those bearing on the cultivation of these crops in Germany.

TROTTER (A.). **Le 'virosi' del Cestrum parqui L'Hérit.** [Virus diseases of *Cestrum parqui* L'Hérit.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), iv, pp. 18–24, 1 pl., 1 fig., 1935.

Cestrum parqui hedges growing in different parts of the Campagna were recently observed to show leaf abnormalities, consisting of various combinations [which are described] of surface wrinkling, edge waving, and chlorosis, apparently due to virus attack. The cells of the affected tissues showed inclusions and other cytological modifications typical of a virus disease. The author suspects that the disease, which resembles in some respects potato leaf roll and mosaic, has been acquired by this Solanaceous host from potato crops in the vicinity.

BALD (J. G.). **Statistical aspect of the production of primary lesions by plant viruses.**—*Nature, Lond.*, cxxxv, 3424, p. 996, 1935.

Referring to the recent paper in which Youden, Beale, and Guthrie suggest that the relation between the numbers of local lesions on the leaves of virus-inoculated plants and the relative concentrations of virus particles in the inoculum may be expressed as $y = N\ (1-e^{-ax})$ [*R.A.M.*, xiv, p. 601 and next abstract], the author points out that although this equation is, in all probability, fundamentally correct, and in the data cited by Youden *et al.* the values for the low dilutions are fitted by the equation, the calculated values for the higher ones are almost uniformly too small, and sometimes far beyond the limits of the experimental error. To plot the values of log $(N-y)$ against concentration and show that in selected cases the values fall approximately on a straight line gives a misleading idea of the fit, since when N is much greater than y, y may vary widely without causing wide departures from a straight line. Experimental data obtained by the writer and Samuel from dilutions of tobacco mosaic juice indicate that the relation of number of lesions to concentration could not be expressed by the function. The evidence obtained has shown that the equation applies only to very carefully purified suspensions of virus, distortions existing with samples so far purified that only slight pigmentation remained.

YOUDEN (W. J.). **Statistical aspect of the production of primary lesions by plant viruses.**—*Nature, Lond.*, cxxxv, 3426, p. 1075, 1935.

The failure of Samuel and Bald to reconcile their experimental data concerning the production of primary lesions by plant viruses with the values calculated from the equation of Youden and his collaborators [see preceding abstract] is thought to be attributable mainly to a lack of conformity between the dilution data of the first-named workers and the curves obtained by others. It is true that the equation gives low values at high dilutions, but there is no indication that its application is limited, at least over a considerable range of dilution, to highly purified virus preparations. The writer concludes that Samuel's and Bald's data cannot be used to condemn the validity of the equation.

CHESTER (K. S.). **Serological evidence in plant-virus classification.**—*Phytopathology*, xxv, 7, pp. 686–701, 2 figs., 1935.

This is an expanded account of the writer's experiments, conducted

chiefly by means of the precipitin and complement-fixation techniques, to determine the serological relationships between a number of plant viruses, a preliminary note on which has already appeared [*R.A.M.*, xiv, p. 385]. In addition to those previously mentioned, potato mild mosaic and Osborn's pea mosaic virus No. 2 [ibid., xiv, p. 486] were found to represent distinct entities. The veinbanding virus of potato [ibid., xiv, p. 723] and cucumber mosaic [ibid., xiv, pp. 659, 660] appear from their strong mutual reactions, as well as from the outcome of inoculation tests, to be merely strains of a single virus which probably also includes Valleau's (Kentucky) tobacco virus 10729. Precipitin tests indicated a much more distant serological relationship between tobacco mosaic and severe etch of tomato [ibid., viii, p. 270]. Osborn's pea mosaic viruses Nos. 2 and 3, which were shown by these tests to differ from all the others studied, appear from their serological reactions to be strains of the same virus type. The usefulness of serologic reaction in the classification of viruses was confirmed by tests of virus samples submitted as unknowns, and the technique is considered to afford the chief line of attack in the study of the chemical basis of specificity.

CHESTER (K. S.). **The antigenicity of the plant viruses.**—*Phytopathology*, xxv, 7, pp. 702–714, 4 graphs, 1935.

As already shown by Helen P. Beale [*R.A.M.*, xiv, p. 197], the tobacco mosaic precipitin reaction was found in the writer's serological experiments [see preceding abstract] to be independent of host species within the Solanaceae, while Birkeland's observation [ibid., xiii, p. 545] that purified tobacco mosaic virus retains its specific precipitin reactivity was also confirmed.

When the tobacco mosaic, tobacco ring spot [ibid., xiv, p. 659], potato veinbanding, and potato ring spot [ibid., xiv, p. 385] viruses are inactivated either by series of progressive strengths of silver nitrate, potassium permanganate, or chloramine T or by heating for ten minutes up to 100° C., and when tobacco mosaic is inactivated by successive changes of the hydrogen ion concentration from P_H 0·5 to 12·0 or progressively fractionated by filtration, in each case the serological reactions are maintained during the presence of the virus in an active form, diminishing in strength *pari passu* with the loss of infectivity, and disappearing at the very point at which the virus becomes no longer demonstrable.

When the tobacco mosaic and potato latent mosaic (healthy potato or X) [ibid., xiv, p. 714] virus-immune sera are tested with their respective viruses propagated in hosts such as phlox, zinnia, and beet, only very distantly related to those used in serum preparation, serological reactions are still demonstrable, being correlated with the amount of inoculum independently of the hosts used.

Discussing these findings, and other evidence available concerning the antigenicity of the plant viruses, the writer thinks it may reasonably be concluded that the antigens responsible for the serological reactions under observation are the viruses themselves, and not the normal or derived constituents of diseased plants.

Mattirolo (O.). **Un nuovo simbionte del Pioppo canadese. Nota I. Ancora sulla simbiosi del 'Tuber magnatum Pico' con i 'Pioppi canadesi' e osservazione sul processo di maturazione dei 'funghi ipogei'. Nota II.** [A new symbiont of the Canadian Poplar. Note I. A further report on the symbiosis of *Tuber magnatum* Pico with Canadian Poplars and observations on the process of ripening in hypogeous fungi. Note II.]—*Ann. Accad. Agric. Torino*, lxxvii, pp. 131–146, 1 pl., 1935.

Symbiosis has been found to occur in Piedmont between Canadian poplars (*Populus virginiana* Durr. and *P. monilifera* Ait. [*P. balsamifera* L.]) and *Tuber magnatum* in addition to *T. borchii* previously recorded [*R.A.M.*, xiii, p. 718]. The association is confined to alluvial, argillaceo-calcareous soils. Observations are made on the changes of odour (connected with glycogen reaction) and colour accompanying the ripening process in various kinds of truffles.

Challenger (F.) & Higginbottom (Constance). **The production of trimethylarsine by Penicillium brevicaule (Scopulariopsis brevicaulis).**—*Bio-chem. J.*, xxix, 7, pp. 1757–1778, 1935.

A detailed, fully tabulated account is given of the writers' experimental studies on the mechanism of biological methylation by the mould *Scopulariopsis brevicaulis* [*R.A.M.*, xii, p. 713]. No definite conclusion was reached in regard to the mode of formation of trimethylarsine from arsonoacetic acid, but it is presumed, on the basis of these and other investigations, to be of an enzymic nature.

Challenger (F.). **The biological methylation of compounds of arsenic and selenium.**—*J. Soc. chem. Ind., Lond.*, liv, 28, pp. 657–662, 1935.

A full review and discussion are given of the literature on the methylation by moulds, especially *Scopulariopsis brevicaulis*, of arsenic and selenium compounds in the pigments of wall-papers, plasters, and the like [see preceding abstract].

Varadaraja Iyengar (A. V.). **Some biochemical factors of disease resistance in plants.**—*Curr. Sci.*, iv, 1, pp. 47–50, 1935.

Some general observations, amplified by references to the relevant contemporary literature, are made on the contribution of biochemical factors to disease resistance in plants. The subject is discussed under the following headings: nature of disease-resistant factors; isolation of inhibitory substances; individual chemical compounds in relation to disease resistance; reaction of tissue fluid; enzymes in relation to disease resistance; and disease susceptibility and nutritional factors.

Arata (Maria). **Il meccanismo dell'immunità nei vegetali.** [The mechanism of immunity in plants.]—Reprinted from *Boll. Ist. sieroter. Milano*, xiv, 6–7, 38 pp., 26 figs. (2 col.), 1935. [German summary.]

This paper, describing the author's investigations on the defensive reactions of vaccinated and unvaccinated beans [*Phaseolus vulgaris*] towards *Botrytis cinerea*, is the full Italian version of a shorter one already noticed from other sources [*R.A.M.*, xiv, p. 602].

McCrea (Adelia). **A supplementary note on longevity of Aspergillus oryzae and Rhizopus nigricans.**—*Pap. Mich. Acad. Sci.*, xx, pp. 79–80, 1935.

In 1919, 1927, and 1932, the writer readily obtained viable cultures on a number of standard media from dry 'spore dust' of *Aspergillus oryzae* [*R.A.M.*, xiv, p. 648], sealed in a tube in 1897. The fungus also remained alive for ten years on 4 per cent. glucose agar in a test-tube. *Rhizopus nigricans*, an accidental contaminant of the original culture of *A. oryzae*, survived the 30-year test in 1927 but was no longer viable in 1932 [cf. ibid., xi, p. 318].

Barrus (M. F.) & Crosby (C. R.). **Control of diseases and insect pests of Potatoes on Long Island.**—*Ext. Bull. Cornell agric. Exp. Sta.* 288, 26 pp., 4 figs., 1935.

This bulletin gives an outline, for the special use of Long Island potato-growers, of control measures, the efficacy of which has been established in practice against virus, bacterial, and fungal diseases, as well as against insect pests of the crop. It also gives a brief, popular account of the more important parasites and virus diseases of the potato in Long Island.

Brentzel (W. E.). **Types of Potato virus diseases in North Dakota.**—*Bull. N. Dak. agric. Exp. Sta.* 282, 23 pp., 12 figs., 1935.

Popular notes are given on the following virus diseases affecting the North Dakota potato crop: spindle tuber, rugose, mild, crinkle, leaf-rolling, and interveinal mosaics, leaf roll, mottled and unmottled curly dwarf, and witches' broom [cf. *R.A.M.*, xiv, p. 714]. The control of the diseases, based on the elimination of the insect vectors, roguing, and selection by tuber-indexing, is briefly discussed.

Barton-Wright (E. C.), Cockerham (G.), & M'Bain (A. M.). **Virus disease research.**—ex *Rep. Scot. Soc. Res. Pl. Breed. Ann. gen. Meet. 25th July, 1935*, pp. 14–17, 1935.

Further investigations at Corstorphine Plant-Breeding Station and the North of Scotland Sub-Station into the physiology of potato virus diseases [*R.A.M.*, xiii, pp. 321, 721] showed that the main differences between healthy and crinkle plants are that protein synthesis occurs later in the growing season in diseased than in healthy plants, that protein hydrolysis in crinkle plants is retarded, and that affected plants show interference with the normal channel of transport of nitrogen fractions.

In further breeding work, the Shamrock variety, resistant to virus diseases, was selfed and over 300 seedlings were raised with the object of finding out whether any segregation had occurred. The seedlings were classified as (*a*) apparently healthy or (*b*) virus infected. Evidence was obtained of two distinct types of resistance, viz., resistance to natural infection and tolerance of the pathogen after infection. No potato variety or seedling has been found to possess complete resistance to all the chief potato viruses, but a high degree of tolerance to individual viruses has been exhibited by some of them.

A comprehensive test of the copper strip method of discriminating between healthy and degenerate tubers [see next abstract] made on 600 tubers of 53 varieties showed the method to be of little value.

KAHO (H.). **Zur Physiologie der Kartoffel. II. Ein Beitrag zur Diagnose abbaukranker Knollen.** [On the physiology of the Potato. II. A contribution to the diagnosis of degenerate tubers.]—*Phytopath. Z.*, viii, 4, pp. 323–335, 1935.

Continuing his studies [*R.A.M.*, xiv, p. 465] on the physiology of potato 'degeneration' in Esthonia (where this condition is stated to be economically unimportant, mosaic being infrequent and leaf roll absent), the writer determined the oxidation-reduction rate of the tubers of nine healthy and three 'degenerate' varieties in an alcoholic guaiacum solution, details of the method adopted being given. The former group, including Imperator, Odenwälder Blaue, Deodara, Majestic, and Allerfrüheste Gelbe, responded so much more rapidly to the oxidation-reduction process (in 11 to 22 minutes) than the latter, comprising Bravo I and II and Imperator (which required 81 to 89 minutes), that a direct correlation may be established between velocity of reduction and vitality.

Tests were also conducted by the sheet copper method of Bechhold and Erbe [ibid., xiii, p. 649], which proved, however, less reliable for the end in view owing to the relative scantiness of melanin formation by potato tubers under the prevailing favourable ecological and climatic conditions of Esthonia.

PFANKUCH (E.). **Zur Biochemie des Kartoffelabbaues. III. Mitteilung: Ascorbinsäure, Glutathion und Zucker.** [A contribution to the biochemistry of Potato degeneration. Note III: Ascorbic acid, glutathion, and sugar.]—*Biochem. Z.*, cclxxix, 1–2, pp. 115–130, 1935.

No increase over the normal content of glutathion (2 to 5 mg. per cent.) and ascorbic acid (15 to 20 mg. per cent.) could be detected in the expressed juices of 'degenerate' potato tubers [*R.A.M.*, xiv, p. 650], the enhanced reducing capacity of which must be ascribed, therefore, to an augmented dehydrogenase activity.

In the expressed juices both of 'degenerate' potato tubers and of those (Klein-Spiegeler Wohltmann) artificially inoculated with the leaf roll virus [ibid., xiii, p. 533] the ratio of cane to reducing sugar was increased, an effect that may follow either a rise in the cane sugar concentration or a reduction in that of the monoses. The manner in which this change, as well as the increased dextrin content of 'degenerate' tubers, are brought about is discussed.

QUANJER (H. M.) & GÄUMANN (E.). **Versuche über den Einfluss des Klimas auf den Gesundheitszustand der Kartoffelpflanze.** [Experiments on the influence of climate on the state of health of the Potato plant.]—*Phytopath. Z.*, viii, 4, pp. 307–321, 1 fig., 5 diags., 1935.

Following a concise introductory survey of the literature on ecological factors in relation to potato degeneration [*R.A.M.*, xiv, pp. 54, 387,

and preceding abstracts], the writers give an account of preliminary experiments in Switzerland to determine the influence of altitude on the incidence, virulence, and course of mosaic (anecrotic type) [ibid., x, p. 746; xiv, p. 250].

The disease was found to persist in Eigenheimer tubers transferred from Wageningen, Holland, to the Alps, so that the practice of introducing infected material into relatively disease-free mountain regions should be discontinued as offering no hope of a cure. At a height of 1,680 m. above sea-level infection was transmitted from diseased plants to their healthy neighbours, though to a much lesser extent than in the foothills (455 m. above sea-level), where 10 per cent. mosaic may lead to the infestation of practically the entire crop in a year without any signs of physiological deterioration. An intensely severe form of the disease, accompanied by general stunting, may develop in addition to the common type in the mountains, possibly as a result of mixed infection [ibid., xiv, p. 388]. At 1,680 m. above sea-level the mosaic introduced in 1932 had not spread by means of fresh infections by the summer of 1933, whereas at 455 m. a considerable extension of the common mild symptoms was observed.

Ducomet (V.), Foëx (E.), & Alabouvette (L.). **Les maladies de la Pomme de terre.** [Potato diseases.]—Issued by Minist. Agric. France, 40 pp., 20 col. pl., 1 fig., 1 diag., 1935.

Semi-popular notes are given on a number of well-known potato diseases [the symptoms of which are illustrated by excellent coloured plates] occurring in France, with directions for their control. A useful key and some observations on selection and storage are appended.

Cristinzio (M.). **Le 'virosi' delle Patate 'Riccia' e 'Biancona' di Napoli nell'annata 1934.** [The virus diseases of Neapolitan 'Riccia' and 'Biancona' potatoes in the year 1934.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), iv, pp. 51–65, 2 pl., 3 figs., 1935.

In a tour of inspection made recently in the vicinity of Naples to ascertain whether the decline in the yields of the formerly highly satisfactory Riccia and Biancona potato varieties might be due to virus diseases it was ascertained that the latter variety showed 15 to 35 per cent. leaf roll, 2 to 12 per cent. rugose mosaic, and 2 to 5 per cent. crinkle A [*R.A.M.*, xiv, p. 681], according to the locality; ordinary mosaic occurred on a few plants of this variety in two areas only. The Riccia variety showed 6 to 8 per cent. crinkle A, little or no rugose mosaic, and 1 to 2 per cent. witches' broom, the principal disease attacking this variety being dwarfing, probably due to some unidentified virus. The incidence of these virus diseases was sufficient to account for a reduction of yield by at least 20 to 30 per cent.

Porter (D. R.). **Insect transmission, host range, and field spread of Potato calico.**—*Hilgardia*, ix, 8, pp. 383–394, 7 figs., 2 diags., 1935.

A concise account is given of continued experiments at the California Agricultural Experiment Station [*R.A.M.*, xi, p. 320] on the transmission of potato calico, the results of which demonstrated conclusively

that the potato aphid (*Macrosiphum solanifolii*) [*M. gei*] is a vector of this disease. Calico was further shown to be transmissible by mechanical inoculation to tomato, pepper (*Capsicum annuum*), eggplant [ibid., xii, p. 615], *Datura stramonium*, and *Petunia* sp., but not to or from lucerne and certain weeds (*Ambrosia* and *Amaranthus* spp.), though these, when growing in the vicinity of calico-infected potatoes, frequently exhibit symptoms very suggestive of the disease. The results of experiments at Santa Clara, Stockton, and Davis clearly demonstrated the natural spread of calico on potato in the field. To test the effect of the date of sowing on the spread of calico, identical stock (halved tubers) was planted in 1931 at Stockton on 12th April, and at Davis on 16th June, previous experiments having shown that the rate of spread of potato virus diseases is practically the same in the two localities; the results showed that late planting reduced the percentage of spread from 55 at Stockton to 7 at Davis. This is considered to be a further confirmation of the fact established in a recent communication from the author [ibid., xiv, p. 714] that late planting in the Sacramento and San Joaquin valleys of California often produces potato seed stock relatively free from virus infection and capable of producing high yields in the next generation.

It is stated that, although still present in all the important potato-growing districts of California, calico has caused very slight losses during 1932, 1933, and 1934, maximum infection having been less than 3 per cent., with an average of less than 1 per cent. for the whole of the State. Besides White Rose, the most important variety grown, the disease has also been found on Bliss Triumph, Idaho Rural, and Garnet Chili, and it has been experimentally transmitted to a number of other varieties, including Early Rose, Green Mountain, and Irish Cobbler.

Lindfors (T.). **Potatiskräftan i Sverige : dess utbredning och bekämpande intill år 1935.** [Potato wart in Sweden; its distribution and control up to the year 1935.]—*Medd. Växtskyddsanst. Stockh.* 11, 5 graphs, 3 maps, 1935.

A tabulated account is given of the distribution of potato wart [*Synchytrium endobioticum*] in Sweden [*R.A.M.*, xi, p. 533; xii, p. 51; xiii, p. 799] since its discovery in the Stockholm province in 1912, followed by apparently complete disappearance until 1928. At the time of writing the centres of infection throughout the country numbered 360, covering an area of 4,329 hect. The province of Halland shows the heaviest infestation, with 100 centres covering 2,026 hect., followed by Blekinge with 78 (545) and Örebro with 52 (540). After the intense activity of the fungus in 1928, when 97 fresh centres (1,020 hect.) were declared to be infected, there was a successive decline until 1931, when only 24 new cases were detected, followed by another rise to 79 in 1934.

Instances are cited showing that the spread of wart disease is largely effected by means of seed potatoes, while other important sources of dissemination include manure, domestic animals (especially poultry), agricultural implements, and running water. There is reason to believe that crows and other birds may be implicated in the transmission of the fungus over long distances.

Evidence of viability of the spores of *S. endobioticum* extending over a period of 13 years in Finland and 10 years in Denmark is quoted. Among the Solanaceae other than potato found susceptible to wart disease in inoculation experiments [cf. ibid., xiii, p. 652] are tomato and the weeds *Solanum nigrum*, *S. dulcamara*, and *Hyoscyamus niger*, none of which, however, would appear to be of practical importance in the spread of infection.

The results [which are briefly summarized] of soil disinfection experiments against wart disease in Sweden and elsewhere have not been generally encouraging from a practical standpoint. The legislation against *Synchytrium endobioticum* is discussed with special reference to its operation in the Scandinavian countries. From 1929 to 1935, inclusive, a total of 241,472 kg. of potatoes belonging to such immune varieties as Majestic, Arran Consul, King George V, Ackersegen, Erdgold, Hindenburg, and Parnassia was supplied under official supervision to growers in the infested areas of Sweden, and 13,000 kg. to those in other districts. All these are late varieties (except Parnassia, used for industrial purposes only) and the need for immune early sorts suitable for Swedish conditions is keenly felt. Juli and Dargill Early are slightly backward in development and their yellow flesh is also unacceptable, while Arran Crest and Arran Pilot are susceptible to a number of diseases and keep badly in Sweden.

COLLINS (E. J.). **The problem of immunity to wart disease (Synchytrium endobioticum (Schilb.) Perc.) in the Potato.**—*Ann. Bot., Lond.*, xlix, 195, pp. 479–491, 1935.

In this paper the author compares the results [which are tabulated] obtained by him at Ormskirk from 1915 to 1927 in tests for immunity from potato wart disease (*Synchytrium endobioticum*) [*R.A.M.*, i, p. 131; cf. also xiv, p. 389] of potato seedlings raised in breeding work for resistance to late blight (*Phytophthora infestans*), with those reported by Salaman and Lesley [ibid., iii, p. 169], and recently by Lunden and Jørstad [ibid., xiv, p. 251], in an attempt to throw some light on the problem of the inheritance of genetic factors for wart resistance. In his own trials selfed Majestic (immune) seedlings segregated on a basis closely approximating a 1 susceptible to 3 resistant ratio, and results of crosses of Majestic and other immune varieties tended to support this assumption. In the immune × immune class, a cross of Defiance × Leinster Wonder produced five seedlings, all of which proved to be immune, while the majority of the other crosses tested segregated in a ratio approximating 1 S to 3 R. In the selfed susceptible class he could only use the offspring from two proved susceptible seedlings (each obtained from crossing two immune varieties), one of which gave an entirely susceptible progeny, and the second gave 26 susceptible and 3 resistant descendants. These figures are taken to indicate complete susceptibility of the offspring. In the susceptible × susceptible class the results showed that British Queen, President, and Edgecote Purple are pure susceptible varieties. In the immune × susceptible class a total of 174 seedlings tested gave 82 S, 70 R, and 22 plants useless for the tests because of lack of vigour. While in some of the families there was an indication of segregation on the basis of an equality ratio, the group

as a whole is less amenable to explanation in view of the wide fluctuations which were observed. In the susceptible × immune class 184 seedlings gave 81 S, 82 R, and 21 'too poor' plants, a very close approximation to equality in segregation; there were, however, outstanding examples of individual deviation, as, for instance, in the Epicure × Majestic cross, which gave 1 S to 8 R.

In the author's opinion the bulk of the evidence appears to be in favour of a simplification of the problem of the inheritance of resistance to potato wart disease rather than the multiplication of factors for immunity and others for inhibiting them, each variety of potato being a law to itself.

Blodgett (F. M.), Mader (E. O.), Burke (O. D.), & McCormack (R. B.). **Three years' results using Bordeaux mixture with reduced amounts of lime as a Potato spray.**—*Amer. Potato J.*, xii, 7, pp. 171–177, 1935.

In continued experiments with Rural potatoes in New York State and with Green Mountains on Long Island [*R.A.M.*, xii, p. 653; xiv, p. 606] the authors confirmed the beneficial effect on yield of spraying the potatoes with Bordeaux mixture even in the absence of late blight [*Phytophthora infestans*], and also showed that it appears safe and desirable to reduce the lime in the mixture at least to half as much as the amount of copper sulphate. In one trial at Pittsford there was a clear indication that with a 5–1¼–50 mixture not so much copper per acre is necessary to give maximum yields as with mixtures containing larger proportions of lime.

Bates (G. H.) & Martin (L. D.). **Sulphuric acid spraying of Potato haulm to prevent late infection of the tubers with blight.**—*J. Minist. Agric.*, xlii, 3, pp. 231–235, 1935.

An account is given of experiments in 1934–5 at King's Lynn, Norfolk, the results of which showed that spraying the potato haulm in the middle of September, when it was still green, with a 10 or 20 per cent. dilution of brown oil of vitriol (containing 77 per cent. of sulphuric acid) rapidly killed the haulm and weeds and did not adversely affect the yield in 'ware' tubers, as compared with control plots, when the crop was lifted three weeks after the application. Examination of the stored potatoes 17 weeks after harvest showed that the percentage of tubers attacked by late blight (*Phytophthora infestans*) [*R.A.M.*, xiv, p. 527] was reduced from 3·9 in the control tubers to 0·66 and 0·49 in the tubers from the sprayed plots, respectively.

The costings of the experiments indicated that the treatment was financially justified even in a season when the incidence of late blight was slight, apart from the considerable advantages resulting from the destruction of the potato haulm and field weeds before harvest.

MacDowall (R. K.). **Potato blight. A new method of control by chemical spraying.**—*Scot. J. Agric.*, xviii, 3, pp. 243–249, 1 pl., 1935.

A detailed account is given of the method of control of potato blight (*Phytophthora infestans*) by destroying the haulms with a sulphuric acid spray [see preceding abstract].

Hori (M.). **On the relation between cell contents and the infection in Phytophthora infestans.**—*Ann. phytopath. Soc. Japan*, v, 1, pp. 10–22, 1935. [Japanese, with English summary.]

A study of the influence of plant excretions upon infection by *Phytophthora infestans* showed that when water was laid on the surface of the leaves of various plants (all those examined except young tobacco leaves) the zoospores were liberated by the sporangia, swam about, and finally became uniformly distributed on the surface of the leaves, their arrangement bearing no relation to the position of the stomata or the juncture of two epidermal cells. The zoospores were strongly or weakly attracted by the parenchymatous tissues of certain plants. Of some 80 chemical solutions tested, all the acid substances attracted, and all the alkaline ones repelled, the zoospores, while all the neutral agents were inactive. To penetrate the [epidermal] cell wall the fungus did not require the presence of soluble [attractive] substances in the cell, nor was such penetration affected by the alkalinity or acidity of the medium in which the zoospores were liberated. When inoculated on the under-surface of the stripped epidermis or on the surface of the sub-epidermal tissue of various resistant plants, *P. infestans* easily penetrated into the cells. It is concluded that until infection is established the cell contents have no effect on the behaviour of the fungus.

Da Silveira e Azevedo (N. A.). **Sobre a doença da Batatinha no municipio de Theresopolis.** [On the Potato disease in the municipality of Theresopolis.]—*Rodriguesia*, i, 1, pp. 9–12, 3 pl., 1935.

A serious potato disease in the municipality of Theresopolis, Brazil, characterized by the simultaneous wilting of the tops and a slimy rot of the tubers, was shown by isolations to be caused by *Bacterium solanacearum* [*R.A.M.*, xiii, p. 687]. While this appears to be the first official record of the disease in the locality, evidence indicates that it is of long standing there. Cutting seed tubers before planting is believed to favour infection of the resulting plants, and is therefore deprecated. The disease may be controlled by the use of seed tubers from healthy plants together with disinfection either by mercuric chloride (1 in 1,000) for 1½ hours or with a 2 per cent. formalin solution for 2 hours, while some growers recommend 0·5 per cent. copper sulphate for 10 to 12 hours, followed by immersion in a 5 per cent. milk of lime.

Annual Report. Pathological Division.—*Rep. Rubb. Res. Inst. Malaya, 1934*, pp. 95–115, 2 graphs, 1935.

During the period under review the increasing importance of brown root disease of *Hevea* rubber due to *Fomes noxius* became apparent. Particular attention is now being paid in Malaya to the control of this and other root diseases (*F. lignosus*, *Ganoderma pseudoferreum*) [*R.A.M.*, xiii, p. 726], both in those areas where natural covers and rubber seedlings have been allowed to develop and in new plantings previously occupied by old rubber considerably reduced by root infection. The deterrent effect of 'forest conditions' on the spread of root disease is attributed to the loss of vigour of the rhizomorphs owing to their division into many small branches in an endeavour to pass through

the maze of roots present in forest-covered soils. In replanting old rubber all diseased roots in the infected areas should be eradicated completely by systematic digging.

In many tests the superiority of the tar distillate emulsions in the control of mouldy rot (*Ceratostomella fimbriata*) [ibid., xiii, p. 471] was again demonstrated, the best being killgerm and linsocresyl (each 10 per cent. in water), which controlled the disease after 16 and 17 daily applications, respectively.

Young clearings of budded rubber are stated to be frequently attacked by pink disease (*Corticium salmonicolor*) [ibid., xiii, p. 125]; it is recommended that water-miscible fungicides only should be applied to the comparatively delicate immature bark.

The delayed and very prolonged refoliation period in 1934 resulted in widespread infection by *Oidium heveae* [ibid., xiv, p. 331 and above, p. 743]. Very few cases of serious leaf fall occurred, however, and most of these concerned only small areas on poor soil, but mild leaf fall was present practically everywhere. During the season, attempts to dust some 25,000 acres with sulphur were hindered by the inclement weather, and it was not possible to give one treatment every seven days, but, on the whole, the dusting gave 50 per cent. control.

Bisby (G. R.), Timonin (M. I.), & James (N.). **Fungi isolated from soil profiles in Manitoba.**—*Canad. J. Res.*, xiii, 1, pp. 47–65, 1935.

Continuing their studies of the fungal flora of Manitoba soils [*R.A.M.*, xiii, p. 98], the authors give a briefly annotated list of 56 species of fungi not previously known to occur in these soils, which were isolated with others from 12 profiles of five types of virgin soil in Manitoba. In addition to the routine method of incubating dilution plates aerobically at 25° C., some plates were incubated aerobically at 37° or about 6°, and others anaerobically at about 20°. In a discussion of the more important species isolated in this and in the previous investigation [loc. cit.] it is stated that *Mortierella* spp. have proved to be the most abundant Phycomycetes in the soil profiles examined. Species of *Penicillium* constituted one-half of the isolations from the various horizons, in which species of *Aspergillus* were not found to be common; species of *Trichoderma* were much more frequent than the latter. The plates incubated at 37° showed a striking prevalence of *A.* spp., while those incubated at about 6° developed species of *Cylindrocarpon*, Mucorales, *Penicillium*, less frequently *Cladosporium*, and rarely other fungi.

The results of the investigation are considered to indicate clearly the occurrence of a definite fungal flora of the soil, especially when taken in conjunction with the work of Jensen [ibid., x, p. 550] and Ziling [ibid., xii, p. 191], who found the soil flora in Denmark and west Siberia, respectively, very like that in Manitoba, the former also showing the relative infrequence of species of *Aspergillus* in northern areas.

Ogilvie (L.) & Brian (P. W.). **Hot-water treatment for Mint rust.**—*Gdnrs' Chron.*, xcviii, 2535, p. 65, 2 figs. (1 on p. 64), 1935.

Complete control of *Puccinia menthae* [*R.A.M.*, xiii, p. 668] on two forms of the common forcing mint, *Mentha villoso-nervata*, was recently

obtained at the Long Ashton Research Station by ten minutes' immersion of the runners in water maintained at 112° F. A considerable degree of control was also obtained by watering the plants in the outdoor bed with a tar-oil wash in late autumn or early winter, but this process tended to injure the plants.

Salmon (E. S.) & Ware (W. M.). **The downy mildew of the Hop in 1934.**—*J. S.-E. agric. Coll., Wye*, xxxvi, pp. 48–54, 1935.

In this account of the hop downy mildew [*Pseudoperonospora humuli*: *R.A.M.*, xiii, p. 802] situation in England in 1934 the authors state that even during the drought in July runners were found with leaves bearing the conidiophores and spores of the fungus. However much suppressed by drought, the disease is seldom extinct on an infected plant. During the same period a few spikes capable of producing viable spores probably remained unobserved in most gardens, and accounted for damage to the burr and cones following rain in two districts.

New disease of the Hop.—*Fruit-Grower, Lond.*, lxxx, 2064, p. 15, 1935.

According to C. Savidge, County Horticultural Superintendent for Herefordshire, a serious outbreak of hop bine wilt has occurred in that county, the causal organism being identified by L. Ogilvie, of the Long Ashton Research Station, as *Sclerotinia sclerotiorum*, apparently not hitherto recorded as a parasite of this host in England or elsewhere. The attack of the fungus, which was fairly prevalent on lettuces [*R.A.M.*, xii, pp. 421, 485, 780] in the south-west area in 1934, is thought to have probably gained access to the plants through injuries sustained at the time of the mid-May (1935) frost.

Smith (F. E. V.). **Rust disease of Pimento.**—*J. Jamaica agric. Soc.*, xxxix, 6–7, pp. 408–411, 1935.

Pimento [*Pimenta officinalis*] rust [*R.A.M.*, xiv, p. 656], first reported in the spring of 1934, was recorded early in 1935 from every parish in Jamaica except Portland. The causal organism, identified by Miss Wakefield as *Puccinia psidii*, is a common parasite of the rose apple [*Eugenia malaccensis*], and as this host was observed for several years to be severely affected in close proximity to healthy pimento, the pimento strain is almost certainly a very recent mutation of the other.

The disease attacks only the young tissues, causing early defoliation, death of the young twigs, and shedding of the flowers and young berries, with consequent reduction of yield; it has not so far proved fatal.

Spraying is considered impracticable because of the wide area affected, the necessity of making frequent applications to protect the young growth, and the fact that nearly all the trees are wild, none growing under plantation conditions where direct methods of control are economically advantageous. Though the damage already caused, especially in some districts, has been very severe, it is thought that the losses sustained will not be so serious with the return of normal weather.

Hansford (C. G.). **Sugar-Cane diseases in Uganda.**—*E. Afr. agric. J.*, i, 1, pp. 25–28, 1935.

A brief, popular account is given of the local history, symptoms, and control of sugar-cane mosaic [*R.A.M.*, xii, p. 422] and red stripe disease (*Bacterium rubrilineans*) [ibid., xiii, pp. 324, 686; xiv, p. 56] in Uganda, where the former is no longer economically important owing to the use of the resistant P.O.J. 2725 and 2878 canes. Red stripe is thought to have spread from some local grass, probably *Pennisetum purpureum*. The paper concludes with short notes on top rot [ibid., viii, p. 337], root diseases (which are almost non-existent in Uganda at present), and leaf spots (*Cercospora* and *Helminthosporium* spp.).

Petrak (F.) & Sydow (H.). **Kritisch-systematische Originaluntersuchungen über Pyrenomyzeten, Sphaeropsideen und Melanconieen.** [Original critical and systematic studies on Pyrenomycetes, Sphaeropsideae, and Melanconiae.]—*Ann. Mycol., Berl.*, xxxiii, 3–4, pp. 157–193, 1935.

The results of the authors' re-examination of a number of Spegazzini's genera and species of fungi are given [cf. *R.A.M.*, v, p. 331]. The type species of *Ephelidium*, *E. aurantiorum*, is stated by Spegazzini in *An. cient. argent.*, xl, p. 84, 1920, to be an imperfect stage of *Amylirosa aurantiorum* [*R.A.M.*, xiii, p. 437], other phases in the life-cycle of which are represented by *Pseudhaplosporella aurantiorum* and *Paradiplodia aurantiorum* [ibid., i, p. 350]. The identity of the two last-named with *Botryodiplodia lecanidion* (Speg.) Pet. & Syd. has been demonstrated in earlier researches by the writers. A critical inspection of Spegazzini's original material of *E. aurantiorum* (No. 1027 in his herbarium, collected in October, 1919) has convinced the authors that the fungus is a parasite of the *Botryodiplodia* stroma, entirely unconnected with its life-history. The genus should be cancelled owing to the anomalous nature of its diagnosis, part of which refers to the stroma of the fungal host.

The type species of Spegazzini's genus *Asbolisia* [ibid., iii, p. 211], *A.* (*Chaetophoma*) *ampullula* (*Physis, B. Aires*, iv, p. 293, 1918), has been found to be a parasite of *Meliola dubia* Speg. and is referred to the genus *Cicinnobella* as *C. ampullula* (Speg.) Pet. & Syd.

Sydow (H.). **Beschreibungen neuer südafrikanischer Pilze VI.** [Descriptions of new South African fungi VI.]—*Ann. mycol., Berl.*, xxxiii, 3–4, pp. 230–237, 1935.

An annotated list, supplemented by Latin diagnoses, is given of 19 new species of smuts, Ascomycetes, and Fungi Imperfecti collected in South Africa, of which the following (all from Pretoria) may be mentioned. *Entyloma zinniae* n.sp. forms on the leaves of *Zinnia pauciflora* yellow, later brown, circular to irregular spots, 2 to 5 mm. in diameter; it is characterized by globular or subglobular spores, 8 to 12 or up to 13 μ in diameter, with a yellowish- or light-brown epispore, 1·5 to 2 μ in thickness. *Phyllactinia acaciae* n.sp., occurring on both leaf surfaces of *Acacia robusta*, has cylindrical conidia, often with a median constriction, obtusely rounded at both ends, 50 to 70 by 12 to

16 μ; perithecia 120 to 210 μ in diameter with 6 to 10 hyaline appendages, 70 to 120 by 25 to 35 μ, conspicuously swollen at the base; and 5 to 10 ovate or subglobose asci, 45 to 60 by 20 to 30 μ, containing 2 to 3 spores, 22 to 30 by 12 to 14 μ. The pseudosclerotia of *Balansia cynodontis* n.sp. are formed singly on the haulm nodes, mostly between two leaves, of *Cynodon dactylon*; they are erumpent, straight or curved, corniform, 0·5 to 1 cm. in length, with an irregularly bulbous swelling at the base, 2 to 3 mm. in thickness, tapering towards the apex. The stroma covering the upper side of the sclerotia is of variable extent; the densely crowded, oblong to lageniform perithecia measure 175 to 200 by 70 to 90 μ and are furnished with a papillate ostiole and dark-coloured walls, 8 to 15 μ thick; the elongated-cylindrical asci, 110 to 130 by 5·5 to 6 μ, are provided with an apical membranous sheath and contain 8 filiform, hyaline spores, about 1 μ in diameter.

Mains (E. B.). **Michigan fungi. I.**—*Pap. Mich. Acad. Sci.*, xx, pp. 81–93, 5 pl., 1935.

Among the species included in this annotated list of 63 Michigan fungi are *Keithia* [*Didymascella*] *thujina* [*R.A.M.*, xi, pp. 22, 96], causing considerable defoliation of *Thuja occidentalis* in the upper Peninsula in 1933, and *Uromyces flectens*, the short-cycled rust correlated with the common long-cycled species *U. trifolii*, on white clover (*Trifolium repens*) [ibid., xiv, p. 241]. During 1931–2 repeated inoculations with *U. flectens* on white clover yielded only teleutosori, indicating that the species is distinct from *U. trifolii*. Lagerheim's description (*Svensk bot. Tidskr.*, iii, p. 36, 1909) unquestionably refers to the short-cycled rust, so that the retention of his name of *U. flectens* is advisable.

Povah (A. H. W.). **The fungi of Isle Royale, Lake Superior.**—*Pap. Mich. Acad. Sci.*, xx, pp. 113–156, 4 pl., 1935.

The following are among the records of special interest in this annotated list of 525 fungi (of which 185 are believed to be new for the State) collected on Isle Royale, Lake Superior, Michigan, in 1930. 'Bluebottle' flies on grass tips were found to be parasitized by *Entomophthora bullata* Thaxt. sp. nov. ined. with very characteristic subglobose, bullate zygospores, 33 to 50 μ in diameter. The writer was informed by Thaxter that the conidia of *E. bullata* are indistinguishable from those of *E. americana* [*R.A.M.*, viii, p. 720]. Birches (*Betula alba* var. *papyrifera*) were severely attacked by *Nectria galligena* [ibid., xiii, p. 732], producing large black cankers, which also occurred in epidemic form on *Populus tremuloides*, causing a mortality of some 30 per cent. Witches' brooms due to infection by *Peridermium coloradense* [ibid., ix, p. 420] were observed on *Picea mariana* and *P. canadensis*.

Bose (S. R.). **The distribution of some Polypores at our high altitudes.**—*Ann. mycol., Berl.*, xxxiii, 3–4, p. 201, 1935.

The following Polyporaceae, collected from the Lokra Hills, Assam (Bengal), at an altitude of 8,000 to 10,000 ft. above sea-level, are stated never to have been found in the Bengal plains, though common in north temperate regions: *Polyporus squamosus* [*R.A.M.*, xiii, p. 532],

P. sulphureus [ibid., xiv, p. 62], *P. gilvus* [ibid., xi, p. 275] f. *licnoides*, *Fomes fomentarius* [ibid., xiv, p. 62], and *F. pinicola* [ibid., xiii, p. 604]. The absence of these fungi from the Bengal plains is attributed primarily to lack of natural hosts, climatic factors being of secondary importance [ibid., xii, p. 579].

Overholts (L. O.). **The Polyporaceae of Pennsylvania. II. The genera Cyclomyces, Daedalea, Favolus, Fomes, Lenzites, and Trametes.**—*Bull. Pa agr. Exp. Sta.* 316, 16 pp., 2 pl., 1935.

In this, the second paper of this series [*R.A.M.*, xiii, p. 270], the author gives keys to the species of the genera *Cyclomyces*, *Daedalea*, *Favolus*, *Fomes* (which is divided into two sections, namely, *Leuco-* and *Fusco-Fomes*), *Lenzites*, and *Trametes*, which occur in Pennsylvania. Each key is followed by a resumé of the main characters of the species covered by it. The fungus previously referred by American authors to *T. protracta* or *T. odorata*, and by some regarded as a form of *L. sepiaria*, is described as a new species and named *T. americana* [with a diagnosis in English only]. It occurs on dead wood of coniferous trees and on structural timbers. Three new combinations are made, including *Fomes subroseus* [= *Trametes subroseus* Weir] and *F. robustus* var. *tsugina* (= *Fomitiporia tsugina* Murrill).

Tai (F. L.). **Notes on Chinese fungi. V.**—*Bull. Chin. bot. Soc.*, i, 1, pp. 11–35, 11 figs., 1935.

Continuing his studies on Chinese Erysiphaceae [*R.A.M.*, xii, p. 661], the writer gives critical and taxonomic notes on the 44 species (two of them new) and 4 varieties so far recorded for the country. *Microsphaera dentatae* Liou on *Quercus dentata* is renamed *M. alni* var. *dentatae* as it differs from the type only in the open, irregular branches of the perithecial appendages.

A key to the genera and species of Chinese Erysiphaceae and a host index are appended.

Matsumoto (T.) & Yamamoto (W.). **Hypochnus sasakii Shirai in comparison with Corticium stevensii Burt and Corticium koleroga (Cooke) v. Höhn.**—*Trans. nat. Hist. Soc. Formosa*, xxv, pp. 161–175, 2 figs., 1935.

The writers tabulate and discuss the cultural, morphological, and pathogenic differences between *Corticium sasakii* from rice, *C. stevensii* isolated from pear twigs sent by G. F. Weber from the United States and *C. koleroga* isolated by Narasimhan from coffee in India [*R.A.M.*, xiii, pp. 540, 804; xiv, p. 627]. Among the more important distinguishing features may be mentioned the sclerotial shape, colour, and dimensions in the three species. In *C. sasakii* these organs are subglobose or slightly flattened, sayal- to Verona-brown, 16 to 68 by 7 to 26 μ, mostly 26 to 42 by 11 to 20 μ, with fairly thick, brown walls; in *C. stevensii* somewhat flattened, mikado-brown to bistre, 10 to 52 by 4 to 9 μ, mostly 13 to 26 by 6 to 7 μ, with paler and thinner walls than the foregoing; and in *C. koleroga* subglobose, 16 to 55 by 7 to 17 μ, mostly 23 to 36 by 10 to 13 μ, with pale, thin walls. The last-named species, unlike the other two, does not form sclerotia in pure culture. Hyphal fusions were observed

to take place in homologous strains but in no case between the three species studied. Inoculation experiments made on *Codiaeum variegatum*, Japanese pear (*Pyrus serotina*), coffee, and *Gardenia angusta* var. *ovalifolia* showed that all these hosts except the first-named were infected by each of the three *Corticium* species, though differences in their virulence were apparent.

Asuyama (H.). **The life-cycle of heteroecious species of Puccinia. I. Puccinia culmicola Diet. and P. zoysiae Diet.**—*Ann. phytopath. Soc. Japan*, v, 1, pp. 23–29, 3 figs., 1935. [Japanese, with English summary.]

In inoculation experiments on wheat, aecidiospores of *Aecidium berberidis-thunbergii* taken from *Berberis thunbergii* var. *maximowiczii* growing in three localities failed to produce infection, but when barberry was inoculated with teleutospores of *Puccinia culmicola* obtained from *Agropyron semicostatum* abundant pycnidia (which when mature smelt of fish or glue) developed within two weeks, followed three weeks later by aecidia. Inoculations on the leaves of *Agropyron* and rye with these aecidia produced uredosori identical with those of *P. culmicola*. For this reason, and because of their morphological resemblances, *P. culmicola* is considered to be a form of *P. graminis*.

Teleutosori of *P. zoysiae* from *Zoysia japonica* sown on *Paederia chinensis* resulted in the production of aecidia identical with *Aecidium paederae* in 24 days.

Blochwitz (A.). **Die Gattung Aspergillus. IV. Neue Arten. Synonyme. Varianten und Mutanten.** [The genus *Aspergillus*. IV. New species. Synonyms. Variants and mutants.]—*Ann. mycol., Berl.*, xxxiii, 3–4, pp. 238 250, 1935.

Continuing his critical studies on the genus *Aspergillus* [*R.A.M.*, xii, p. 396], the writer describes one new species, *A. hennebergi* [without a Latin diagnosis] and discusses the synonymy of a number of others. In connexion with observations on a series of variants and mutants, Mosseray's reclassification of the *A. niger* group [ibid., xiv, p. 334] is criticized and shown to be based on a very insecure foundation. Many of the species or varieties into which the group is arbitrarily subdivided are considered to be merely anomalies of growth resulting from unfavourable cultural conditions, bacterial contamination, or other external factors.

Muskett (A. E.), Cairns (H.), & Carrothers (E. N.). **Further contributions to the fungus flora of Ulster.**—*Proc. R. Irish Acad.*, Sect. B, xlii, 4, pp. 41–54, 1934. [Received October, 1935.]

This continuation of the authors' previous annotated list of Ulster fungi [*R.A.M.*, xi, p. 746] comprises 275 species and 9 varieties, making a total for the Province of 1,199.

Since the detection of *Corticium anceps* in a parasitic form on bracken (*Pteris aquilina*) [*Pteridium aquilinum*: *R.A.M.*, xiii, p. 815 and next abstract] in 1931, no evidence is forthcoming of any appreciable decline in the growth of the fern as a result of the activity of the fungus.

Gregor (Mary J. F.). **A disease of Bracken and other ferns caused by Corticium anceps (Bres. et Syd.) Gregor.**—*Phytopath. Z.*, viii, 4, pp. 401–418, 11 figs., 1935.

Corticium anceps [see preceding abstract], which in nature has been found only on bracken (*Pteridium aquilinum*) and *Aspidium filix-mas*, was inoculated under controlled conditions into *A. spinulosum*, *A. aculeatum* var. *lobatum*, *Asplenium trichomanes*, *Polypodium vulgare*, *Blechnum spicant*, *Cystopteris fragilis*, and *Scolopendrium vulgare* with positive results.

The mycelium, composed of hyphae 3 to 7 μ in diameter, penetrates the host tissue by means of hyaline, convexo-discoidal infection cushions, 0·07 to 0·3 mm. in diameter, and 0·04 to 0·07 mm. in thickness, and also through the stomata. Basidia are formed superficially and constitute a white, felt-like coating on the under side of the fronds; under appropriate conditions the oval basidiospores, arising from large sterigmata, germinate on the hymenium, either by means of secondary spores on short promycelia [cf. *R.A.M.*, xii, p. 777] or more frequently directly by a germ-tube up to 85 μ in length. The fungus is readily cultivable on various nutrient media, on which numerous sclerotia but no basidia are formed.

The bracken disease [the symptoms of which are fully described] is stated to have been reported from Mecklenburg, Germany, as well as from Scotland and Northern Ireland. It is markedly affected by climatic conditions, having been very prevalent in Scotland in the wet summer of 1931, since when the drier weather has prevented severe outbreaks. Infection by *C. anceps* occurs almost exclusively on the fronds of bracken, never extending more than a few inches down the petiole and in no case involving the rhizomes. A *Corticium* fairly often observed at the base of the petioles at soil level appears to be quite harmless to the plants.

Smith (K. M.) & Bald (J. G.). **A description of a necrotic virus disease affecting Tobacco and other plants.**—*Parasitology*, xxvii, 2, pp. 231–245, 2 pl., 2 graphs, 1935.

An account is given of an apparently hitherto undescribed virus disease which has been frequently observed on seedlings of White Burley, Virginia, and Vermont tobacco, and of *Nicotiana glutinosa* in the glasshouses of the Potato Virus Research Station at Cambridge; the same or a similar disease was also observed at the Waite Institute in South Australia during the years 1931–33. In tobacco seedlings at the two-leaf stage the disease caused a necrosis which spread from the base of the stem along the midrib, often killing the seedling within two or three days. In older, naturally infected seedlings the base of the stem was sometimes constricted by a ring of necrotic tissue, the necrosis occasionally extending up the midrib of the lowest leaf which was killed; this might occur in succession with several leaves, or the plant might eventually recover with no other symptom than a slight retardation of growth. In affected leaves the veins appeared sunken, the leaf curled over, and sometimes whitish etched lines appeared on either side of the veins. A characteristic of the disease was the restriction of the

symptoms to a few leaves, the virus never becoming wholly systemic in tobacco. Necrotic and yellow, rarely concentric rings developed, which on the older leaves often attained several centimetres in diameter and were comparatively faint and irregular in outline. Inoculation of healthy tobacco plants produced usually circular, necrotic lesions on the inoculated leaves, often in considerable numbers; sometimes the lesions were surrounded later by single necrotic rings, and occasionally the necrosis spread subsequently along the midrib and veins of one or two of the older leaves.

On *N. glutinosa* the virus produced on the inoculated leaves lesions which rapidly dried out and became white. Natural infections resulted in symptoms similar to those on tobacco, but the spread of the virus was even more restricted. Local symptoms were produced by inoculation on *Datura stramonium* and tomato, but except for two plants of the former the necrosis did not spread farther. Attempts to infect the potato gave negative results. Cowpea (*Vigna sinensis*), on the other hand, proved to be very susceptible to infection (by spraying the leaves with a suspension of the virus), but the virus very rarely spread beyond the inoculated leaf.

While a special series of experiments showed that in tobacco plants the virus is not present in tissues outside the lesions, it was occasionally found in the roots of young plants, usually in the case of natural infections. Its dilution end-point appeared to be 1 in 10,000; its longevity in extracted sap is about 20 days, and its thermal death-point is 72° C. So far as tested, the virus remained viable for 71 hours in 99 per cent. alcohol. Its particle size was found by the ultra-filtration method to be 20 to 30 $\mu\mu$.

Owing to the necrotic symptoms caused by the virus, the descriptive name 'tobacco necrosis' is suggested for the disease, but if the numerical system of nomenclature advocated by James Johnson is followed, the virus itself should be called 'tobacco virus 10'.

Chester (K. S.). **A serological estimate of the absolute concentration of Tobacco mosaic virus.**—*Science*, N.S., lxxxii, 2114, p. 17, 1935.

Assuming that the molecular weight of the tobacco mosaic virus [see above, p. 782, and next abstract] is 100,000 [*R.A.M.*, xiv, p. 115] and that the concentration of virus particles [ibid., xii, p. 528] is 3×10^7 per c.c., the concentration of the tobacco mosaic virus is 1 mg. in 200,000 l. of sap. If the tobacco mosaic virus is no more antigenic than the *Pneumococcus* carbohydrate (the most highly antigenic substance known, with a minimal precipitating concentration of 0·0004 mg. per c.c.), then 1 c.c. of tobacco mosaic sap (which gives a precipitin titre of 1 : 250) contains at least 0·1 mg. of virus ($0{\cdot}0004 \times 250$). Or if compared with egg albumin, which has a precipitin titre of 1 : 250,000 (0·004 mg. per c.c.), tobacco mosaic sap contains no less than 0·1 to 1·0 mg. per c.c.

Tobacco mosaic sap diluted to 1 : 1,000,000 gives approximately one lesion per leaf on *Nicotiana glutinosa*, and about 0·1 c.c. of diluted sap is used in making the inoculation. From these facts and assuming the molecular weight of the virus to be 100,000, it follows that 1 c.c. of virus sap contains $6{\cdot}06 \times 10^{14}$ to $6{\cdot}06 \times 10^{15}$ molecules of virus and that a single minimal infective dose on *N. glutinosa* corresponds to 60 to

600 million virus molecules. The fact that only a single infection results from inoculation with such enormous numbers may be due either to the scarcity of places suitable for infection, e.g., the protoplasm exposed in the breaking of a leaf hair, or to the aggregation of virus particles.

Livingston (L. G.) & Duggar (B. M.). **Experimental procedures in a study of the location and concentration within the host cell of the virus of Tobacco mosaic.**—*Biol. Bull. Wood's Hole*, lxvii, 3, pp. 504–512, 1934.

Using a Chambers's micro-manipulation apparatus with a Spencer microscope giving a magnification of approximately ×260, the writers carried out at Wisconsin University detailed cytological studies on the hair cells in sections (mounted in 20 per cent. glycerine) of mosaic-infected tobacco plants [see preceding abstract] to determine the location and concentration of the virus in the different parts. The infective principle was found to occur primarily, if not exclusively, in the protoplasmic contents of the cell, rather than in the vacuole. Evidence was obtained that the inclusion bodies occurring in the hair cells are products evolved by the agent; both the vacuolate and striated or so-called 'crystalline' types are fragile structures disintegrating on contact with the micro-needle or pipette and entering the smallest apertures.

Ramsey (G. B.). **Pleospora rot of Tomatoes.**—*J. agric. Res.*, li, 1, pp. 35–43, 2 pl., 1935.

This is a full account of the author's studies of the tomato fruit rot caused in the United States by *Pleospora lycopersici*, a preliminary report of which has been noticed from another source [*R.A.M.*, xiii, p. 548]. In addition to the information already given it is stated that in the course of the last three years the trouble has become increasingly important in tomatoes shipped from California during November and December, and in Mexican shipments in January, losses as high as 50 to 90 per cent. having been reported in some carloads. Inoculation experiments showed that in both mature-green and ripe tomatoes little or no decay developed at temperatures below 45° or above 80° F., the optimum temperature being from 65° to 70°, but at all the temperatures tested the decay progressed more rapidly in ripe than in mature-green fruits. In cultures on potato-dextrose agar (P_H 4·7 and 6·01) the temperature relations of the fungus were: minimum 35°, optimum 70°, and maximum 90°. The optimum temperature for the development of the conidial stage, *Macrosporium sarcinaeforme*, was about 75°, and cultures with a tendency to produce this stage grew more rapidly than those in which the perithecial stage was dominant. At all the temperatures at which the fungus made appreciable growth, the growth rate was more rapid on agar having a P_H value of 6·01 (the average acidity of the ripe tomatoes) than at P_H 4·7 (the average acidity of the mature-green fruit).

McClean (A. P. D.). **The bunchy-top disease of the Tomato. Host range of the bunchy-top virus.**—*Fmg S. Afr.*, x, 112, pp. 302–303, 4 figs., 1935.

A popular note is given on bunchy top of tomatoes in South Africa

[*R.A.M.*, xiii, p. 131], with special reference to the host range of the virus. This has been transmitted to *Solanum aculeatissimum*, *S. aculeastrum*, *S. duplosinuatum*, *S. incanum*, *S. panduraeforme*, *S. nigrum*, *S. sodomaeum*, *Nicandra physaloides*, *Physalis angulata*, *P. viscosa*, tobacco, eggplant, Cape gooseberry [*P. peruviana*], petunia, pepper [*Capsicum annuum*], and potato; in *P. angulata* and *S. nigrum* the symptoms of bunchy top are completely masked. The eradication of these Solanaceous weeds from the vicinity of tomato fields is therefore very important, though in the eastern Transvaal, where the crop is grown practically all the year round, diseased plants in the older fields probably constitute an important source of primary infection.

Stout (G. J.). **Influence of watering treatment on the occurrence of blossom-end rot in greenhouse Tomatoes.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 515–518, 1935.

The results of an experiment conducted in 1932 in Pennsylvania to determine the influence of the time and amount of watering on blossom-end rot of Marhio tomatoes [*R.A.M.*, xiii, pp. 547, 663] indicated that heavy, infrequent applications (11 in six months) are more conducive to freedom from this disease than light, regular waterings (almost daily). However, since a certain amount of blossom-end rot occurred on all the plots, the ideal watering schedule probably lies between the two extremes tested.

Goidànich (G.). **Ueber die wahre Ursache des Burbanksterbens in Italien.** [On the true cause of the dying-off of Burbank Plums in Italy.]—*Z. PflKrankh.*, xlv, 6–7, pp. 335–340, 7 figs., 1935.

In view of the fact that widespread credence has been given to the report emanating from Dr. L. Franceschi and promulgated by Dr. Peraboth in *Z. PflKrankh.*, xlv, pp. 143–146, 1935 [which paper was not noticed in this *Review*] of the implication of *Graphium* [*Ceratostomella*] *ulmi* in the extensive dying-off of Burbank plums now proceeding in Italy [*R.A.M.*, xiv, p. 374], the writer recapitulates his evidence for regarding the disorder as a non-parasitic leptonecrosis [ibid., xiv, p. 454].

Auchanbaugh (J. F.). **Replacement of the Chestnut in Pennsylvania.**—*Bull. Pa Dep. For. Waters* 54, 38 pp., 1935. [Abs. in *J. For.*, xxxiii, 9, pp. 825–826, 1935.]

This is a review by A. G. Hall of a bulletin stated to cover an immense amount of detailed work accomplished by the author during the last five years on the economic, biological, and silvicultural problems created in south-eastern Pennsylvania by the death of the chestnut from blight (*Endothia parasitica*) [*R.A.M.*, xiv, p. 726].

Some 3,000 study plots were established in 1930 in regions where the chestnut formerly abounded—the Mont Alto and Michaux State Forests. Treating the blight damage as an excessively heavy thinning, the author found a decided growth acceleration among the chestnut's former associates, largely consisting of relatively undesirable species, such as rock oak [?*Quercus prinus*] and red maple [*Acer rubrum*]. The removal of chestnut competition increased by 80 per cent. the

diameter growth of the remaining trees. In stands where chestnut comprised the bulk of the stumpage the growing stock had been so heavily depleted that a 5 to 35 per cent. deficiency still exists, but in stands with less than 10 per cent. chestnut the volume is greater than before the attack. The quality of the stands might be improved by judicious felling, intensive fire protection, and supplemental planting of desirable types of oak and pine. That the chestnut maintains a tenacious hold on existence is shown by the recurrent sprouting from old stumps and the establishment of new seedlings, each fresh batch of shoots being apparently more resistant than the last [ibid., xii, p. 355].

Riccardo (S.). **Contributo sperimentale per lo studio delle alterazioni interne delle Castagne.** [An experimental contribution to the study of internal spoilage of Chestnuts.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), iv, pp. 12–17, 1935.

As chestnuts treated before exportation from Italy with hot or cold water for the destruction of insect larvae sometimes show mould infection [*R.A.M.*, xiii, p. 65 and next abstract] upon arrival in America, the author carried out a series of tests to ascertain the effect of the treatment on fungal and bacterial invasion. The results obtained showed that both the hot and cold water treatments facilitate the entrance of micro-organisms into the chestnuts, that the thick silky covering on the inner surface of the pericarp offers considerable resistance to further penetration, and that the parts most liable to allow infection are the top of the chestnut and the basal scar. Immersion of treated chestnuts in an aqueous carmine solution showed that the dye penetrated in a manner similar to that of the micro-organisms.

Trotter (A.). **Per la prevenzione contro l'ammuffimento delle Castagne.** [For the prevention of Chestnut moulds.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), iv, pp. 67–69, 1935.

After referring to the frequency of mould infection (*Rhacodiella*, *Penicillium*, *Trichothecium*, *Mucor* spp., etc.), and bacterial rots on chestnuts exported from Italy [see preceding abstract] the author gives brief directions for the control of these organisms by improved methods of orchard practice, harvesting, and storage, the removal of affected chestnuts throughout the various operations, and the planting, in the new groves, of resistant strains.

Hamond (Joyce B.). **The morphology, physiology, and mode of parasitism of a species of Chalaropsis infecting nursery Walnut trees.**—*J. Pomol.*, xiii, 2, pp. 81–107, 4 pl., 1935.

This is a full account of the author's comparative studies of the strains of *Chalaropsis thielavioides* from diseased walnut grafts and roots, carrots, and peach seedlings, the more important results of which have been noticed from another source [*R.A.M.*, xiv, pp. 408, 726].

Varadaraja Iyengar (A. V.). **Biochemistry of the spike disease of Vinca rosea Linn.**—*J. Indian Inst. Sci.*, xviiiA, 9, pp. 61–67, 1935.

As in the case of sandal [*Santalum album*] spike, in spiked *Vinca rosea* [*R.A.M.*, viii, p. 146; xiv, p. 539] the total ash and calcium

contents of the stem and leaf tissues are reduced and the nitrogen content increased as a result of the disease, in striking contrast to the depletion of nitrogen and increase of calcium which occur in affected roots. The protein content of diseased plants is generally lower than that of healthy ones, the reverse being observed in the case of ammonia. As in sandal spike, the calcium-nitrogen ratio in the diseased stems and foliage of *V. rosea* is distinctly lower than in healthy ones. Diseased stems and roots contain more starch and the leaves more starch and sugar than corresponding healthy specimens, but diastatic activity in the former is greater than in the latter. Similar observations in respect of starch and sugar contents and diastatic activity were made in spiked and healthy plants of *Zizyphus oenoplia*.

Rangaswami (S.) & Sreenivasaya (M.). **Insect transmission of spike disease of Sandal (Santalum album Linn.).**—*Curr. Sci.*, iv, 1, pp. 17–19, 1–35.

Continuing their studies on the spike disease of sandal (*Santalum album*) [*R.A.M.*, xiv, p. 265], the authors give an account of two experiments carried out in 1934 (one in the midst of a heavily spiked area at Jawlagiri, and the other at Denkanikota, where the disease is only one-fifth as virulent), in which healthy sandal trees were put in insect-proof cages together with spiked ones, and insects, collected during the night, belonging to 252 and 190 different species, respectively, of the local sandal forest fauna, were released in the cages. By the end of April, 1935, 16 of the 37 healthy trees in the Jawlagiri cage became spiked, while no spread was noticed in the Denkanikota cage, although later one plant developed symptoms of the disease. The high percentage (43·2) of transmissions at Jawlagiri is considered to show conclusively that the disease is insect-borne, and also indicated that the insect vectors are active during the night. Suspicion falls on three types of Pentatomidae, two of Jassidae, and three of Fulgoridae, and experiments to determine the part played by them in the transmission of the disease are now in progress.

Darker (G. D.). **Hypodermella hiratsukae, a new species of Hypodermataceae from Japan.**—*J. Arnold Arbor.*, xvi, 3, pp. 364–365, 1 pl., 1935.

Latin and English diagnoses are given of *Hypodermella hiratsukae* sp. nov., collected by N. Hiratsuka on the leaves of *Pinus pumila* in Ishikari Province, Japan, in August, 1927.

The shining black, oblong or elliptical hysterothecia of *H. hiratsukae* measure 0·54 to 1·30 by 0·26 to 0·34 mm. and open by a longitudinal fissure, the basal layer being colourless, plectenchymatous, 20 to 35 μ thick, the covering layer of dark pseudoparenchyma 28 to 34 μ, and the hymenium 100 to 110 μ. The broad, somewhat fusiform asci, truncate to rounded at the tip, measure 87 to 102 by 18 to 24 μ and are occupied by eight clavate-fusiform, hyaline ascospores, tapering towards the base, 36 to 56 by 3·5 to 5 μ, surrounded by a conspicuous gelatinous sheath up to 8 μ thick; the simple, filiform, membranaceous paraphyses measure 100 to 110 by 1 μ. The new species most closely resembles *H. laricis*, the type species of the genus [*R.A.M.*, xii, p. 255], but the

pycnidia and pycnospores so profusely formed by the latter are not known to occur in *H. hiratsukae*.

Lagerberg (T.). **Barrträdens vattved.** [Wet wood of conifers.]—*Svenska SkogsvFören. Tidskr.*, xxxiii, 2, pp. 177–264, 1 pl., 32 figs., 1935. [English summary.]

A characteristic defect of Swedish conifer (pine and spruce) wood is fully described from the morphological, anatomical, silvicultural, and economic standpoints, the mycological aspects of the trouble, known as 'wet wood' and stated to be on the increase, being less exhaustively treated. The present account is based on observations made in 1933 in the affected stands of southern Lapland, supplemented by extensive laboratory studies. In Sweden the disturbance has been found to occur only from upper Dalecarlia northwards; it has been reported also from Norway and northern Finland, where it has, however, attracted little attention.

Two types of wet wood are differentiated, one directly associated with dead branches in the upper part of the trunk and mainly affecting trees upwards of 170 years old, and the other connected with dead roots, occurring below breast-height in younger trees (from 100 years). In the first type the rot assumes the form of streaky infiltrations in the heartwood, which in the second becomes partially or wholly saturated with moisture.

The depreciation in log grading due to wet wood alone was conservatively estimated at 14·6 per cent. The timber also requires a much longer period of seasoning than sound material, and is liable to severe cracking during this process.

Wet wood is not considered to be a true rot. In the branch-borne form of the disease the material has repeatedly been found perfectly sterile, while the Dematiaceae and other fungi associated with wet wood of the roots are obviously soil occupants which penetrate through the cracks and produce a blue-black stain known to lumbermen as 'dark wet wood'. Such changes, however, render the trees accessible to true wood-rotting fungi, mostly confined to the butts and readily removable during logging operations. Cultural studies have shown that *Poria vaporaria*, *Polyporus borealis* [*R.A.M.*, xiii, p. 738], and *P. schweinitzii* are present, but the only organism developing fruiting bodies on transfer to wood is a *Coniophora* closely agreeing with *C. fusispora* (Cooke & Ell.) Cooke described from North America.

Day (W. R.) & Peace (T. R.). **Butt rot of conifers.**—*Forestry*, ix, 1, pp. 60–61, 1935.

The authors state that preliminary investigations have established that *Fomes annosus* [*R.A.M.*, xiv, p. 663] is the fungus most commonly found associated with butt rot in conifer plantations in Great Britain, other records including *Stereum sanguinolentum* [ibid., xiv, p. 728], *Polyporus schweinitzii* [ibid., xi, p. 615], *Pholiota squarrosa* [ibid., xiv, p. 677], and *Armillaria mellea* [ibid., xiii, p. 553; xiv, pp. 618, 677]; it is believed, however, that further researches will add considerably to this list. Butt rot occurs on a great variety of soil types, and has been found in serious amounts on soils which superficial examination would

show to be quite suitable for healthy tree growth. So far European larch [*Larix europaea*] appears to be the most commonly affected, and Norway spruce [*Picea excelsa*] to a rather smaller extent, while it appears almost certain that Scots pine [*Pinus sylvestris*] is less susceptible than either of the two first-named species.

Nisikado (Y.) & Yamauti (K.). **Contributions to the knowledge of sap stains of wood in Japan. III. Studies on Ceratostomella piceae Münch, the cause of a blue stain of Pine trees.**—*Ber. Ōhara Inst.*, vi, 4, pp. 539–560, 5 pl., 1935.

Continuing their studies on the species of *Ceratostomella* responsible for blue stain of pine trees in Japan [*R.A.M.*, xiv, p. 275], the authors give a full, tabulated account of their work on *C. piceae*, which attacks a large number of woods, including *Pinus thunbergii*, *P. densiflora*, *P. parvifolia*, *Chamaecyparis obtusa* Sieb. & Zucc. [*Thuja occidentalis* L.], *Picea jezoensis*, *P. glehnii*, *Quercus grandifolia* Blume [*Q. spicata*], *Magnolia hypoleuca* Sieb. & Zucc., *Betula japonica* Sieb. [*B. alba* L.], and *Acer pictum* Thunb. Standing as well as felled pines are liable to infection by *C. piceae*, the wedge-shaped, greyish-blue discoloration of the sapwood being generally much lighter than that due to *C. pini* or *C. ips* [ibid., xiv, p. 729]. Reports from Saghalien state that standing spruces may also be attacked by *C. piceae*, but in western Japan the fungus is more prevalent in the timber yards.

Strains of the fungus from pine, birch, and other woods were grown on a number of standard media. The hyphae, 3 to 8, commonly 5 μ in diameter, penetrate the parenchyma cells of the medullary rays from the cortex towards the centre, while the resin ducts and tracheids are invaded in a longitudinal and the bordered pits in a tangential direction. *C. piceae* produces three conidial stages [ibid., xiv, pp. 271, 274]: (1) a *Graphium* stage on the surface of the stained sapwood and in culture; (2) a *Cephalosporium* stage, generally formed in culture and sometimes on germ-tubes of ascospores, with elliptical or long elliptical spores with rounded ends; and (3) a *Cladosporium* stage, produced on protuberances at the end of conidial and ascosporal germ-tubes and in culture, with colourless, spindle-shaped, or elliptical spores, straight or rarely curved, with one or both ends pointed, the conidial dimensions of the three types being 3 to 8 by 2 to 4 μ (mean 4·82$\pm$0·03 by 2·50$\pm$0·03 μ), 4 to 12 by 2 to 4 μ (7·17$\pm$0·06 by 2·88$\pm$0·02 μ), and 4 to 22 by 2 to 4 μ (9·13$\pm$0·10 by 2·90$\pm$0·02 μ), respectively. On germinating the conidia swell and assume a spherical, elliptical, or long-elliptical shape, the dimensions at this stage being 6 to 15 by 5 μ. The flask- to bulb-shaped perithecia are produced profusely on the cut surface of timber; those formed in culture on steamed pine blocks measure 105 to 225 by 105 to 225 μ (157·1$\pm$2·34 by 161·2$\pm$2·69 μ) and are furnished with straight or slightly curved beaks, dark brown at the base, becoming lighter towards the apex, 650 to 1,950 μ (1,247$\pm$17·06 μ) long by 5 to 55 μ (26·3$\pm$0·66 μ) at the base and 3 to 18 μ (9·6$\pm$0·05 μ) near the tip, where they are fringed with 10 to 15 hyaline cilia, 20 to 30, rarely 40 μ in length. The spherical or short-elliptical asci, 4·5 to 10·5 μ in diameter, contain eight hyaline, reniform or long-elliptical, straight or curved ascospores, 2·8 to 4·8 by 0·8 to 2·3 μ (3·7$\pm$0·041 by 1·4$\pm$0·026 μ),

becoming globular on germination (5 to 8 by 4 to 5 μ) and producing one or two germ-tubes, over 6 μ thick.

The growth-rate of *Ceratostomella piceae* in culture at 25° C. was found to be much slower than that of *C. pini* and *C. ips*. Neither vegetative growth nor conidial germination takes place in the absence of free oxygen. The conidia and ascospores succumbed to 10 minutes' immersion in water at 52° or 15 at 50°, and were also destroyed by one hour's treatment in 1 in 4,000 mercuric chloride or 1 in 200 formalin and uspulun. Growth was inhibited by the incorporation with malt extract agar of mercuric chloride or uspulun at a strength of 1 in 10,000 or copper sulphate at 1 in 5,000.

Baxter (D. V.). **Some resupinate Polypores from the region of the Great Lakes. VI.**—*Pap. Mich. Acad. Sci.*, xx, pp. 273–281, 6 pl., 1935.

Continuing his studies on the resupinate Polypores of the Great Lakes [*R.A.M.*, xii, p. 543], the writer discusses the pathogenicity, distribution, taxonomy, and hosts of *Poria subacida* [ibid., xi, p. 552] with special reference to its occurrence on white cedar (*Thuja occidentalis*). The type of decay induced on various hosts is a spongy rot, accompanied in the early stages by numerous black spots, which become surrounded by a whitened area and finally disappear. The pale areas expand and the wood surrounding the spots turns straw-coloured. Ultimately the white cavities coalesce and convert the heartwood into a soft, spongy mass of water-soaked fibres. Features similar to the foregoing characterize the 'feather butt rot' of balsam fir (*Abies balsamea*), reported by McCallum from Canada as probably due to the same organism [ibid., viii, p. 412]. The average loss in weight of white cedar wood from the decay caused by *P. subacida* was estimated in cultural tests as 3·54 per cent. of the oven-dry weight in a year. A list is given of 38 different trees liable to attack by *P. subacida*, including sugar maple (*Acer saccharum*), birch (*Betula alba* var. *papyrifera*, *B. lenta*, and *B. lutea*), chestnut, ash, walnut, larch, *Pinus strobus* and eight other species, plane (*Platanus occidentalis*), *Pseudotsuga taxifolia*, oak (*Quercus alba* and *Q. borealis* var. *maxima*), and lime (*Tilia americana*). The fungus commonly produces fruiting bodies on *Thuja plicata* but never, so far as known, on *T. occidentalis*. The latter is affected by a similar rot of white cedar which is common in certain areas and is associated with a sterile fungus probably identical with *P. subacida*.

Armstrong (F. H.). **Further tests on the effect of progressive decay by Trametes serialis Fr. on the mechanical strength of the wood of Sitka Spruce.**—*Forestry*, ix, 1, pp. 62–64, 1 pl., 1 graph, 1935.

The experiments briefly reported in this note showed that the reduction in compressive strength (parallel to the grain) of Sitka spruce [*Picea sitchensis*] wood stands in close relationship to the advance of decay caused by *Trametes serialis* [*R.A.M.*, xi, p. 342] as evidenced by loss in dry weight. The progress of the decay was marked by a very much more brittle and irregular type of fracture. The results of the investigation are in close agreement with those of the previous static bending tests [loc. cit.].

Inoue (Y.). **On some physiological characters of Stereum induratum Berk.**—*Ann. phytopath. Soc. Japan*, v, 1, pp. 1–9, 1935. [Japanese, with English summary.]

When *Stereum induratum* [*R.A.M.*, xiii, p. 135] was cultured on sixteen different media the aerial mycelium (which was almost yellow) grew best on apricot media (decoction and agar). The optimum, minimum, and maximum growth temperatures were, respectively, from 24° to 32°, a little above 4°, and between 36° and 40° C. The fungus was ascertained by Bavendamm's method to belong to the lignin-dissolving group, and to grow best in cultures containing 0·05 to 0·1 per cent. tannic or gallic acid [ibid., viii, p. 281].

Cummins (J. E.). **Tests of the efficacy of the oxy-acetylene scouring and charring process for sterilising partly decayed poles.**—*Pamphl. Coun. sci. industr. Res. Aust.* 57 (*Tech. Pap. Div. For. Prod.* 18), 43 pp., 8 figs., 1935.

A full, tabulated account, preceded by a foreword by I. H. Boas, Chief, Division of Forest Products, Commonwealth Council of Scientific and Industrial Research, is given of laboratory experiments on the new oxy-acetylene scouring and charring process, initially developed by Messrs. Allen-Liversidge (Australia), Ltd., for the treatment of partly decayed standing poles. Based on the outcome of the experimental work (in which *Eucalyptus* poles were used), the following procedure is recommended. The earth or other filling round the poles to a depth of 12 or 18 in., or to the limit of visible external decay, is removed, followed by the trimming off of any sapwood or badly mottled areas for some 30 in. above and 12 in. below ground. After ascertaining by means of a specially designed tool the exact extent of the rot and burning in the hole the chips trimmed off the pole, the prepared portion of the latter is exposed to the action of an oxy-acetylene torch, the pointed flame of which is applied to a crack or decay pocket. An area 18 in. above and from 12 to 18 in. below ground is then charred, applying the torch (with a specially constructed tip designed to give a broad, even flame) vertically and continuing until a charcoal layer about $\frac{1}{16}$ to $\frac{1}{8}$ in. is obtained. Warm or cold creosote oil is next applied under pressure to the pole in the form of a fine, cone-shaped spray commencing at the base and working up to the top of the area to be treated. At least four sprayings should be given at three-minute intervals. When the soil is being returned to the hole, about $\frac{1}{2}$ to 1 gall. creosote should be puddled into it immediately round the pole. A superior creosote should be used, conforming to draft Australian Standard Specification K 55.

Frosch (C. J.). **Chemical studies of wood preservation. V. The correlation of distillation range with the viscosity of creosote. VI. The correlation of the distillation range with the surface tension of creosote. VII. The correlation of distillation range with the interfacial tension of creosote against water.**—*Physics*, vi, 5, pp. 165–177, 5 graphs, 1935.

Viscosity being an important factor influencing the penetration, retention, permanence, and 'bleeding' of the creosotes used in wood

preservation [*R.A.M.*, vii, p. 69; xiii, p. 203], a study was made at the Bell Telephone Laboratories of the viscosity measurements of eight creosotes distilled from one tar but of various boiling ranges. All were found to be truly viscous solutions, their viscosity values being independent of pressure when observed at constant temperature. The viscosity data obtained indicated that the material boiling below 355° C. may be regarded as solvent and the residue above that temperature as solute.

The surface tensions of the eight creosotes used in these experiments were not found to differ appreciably at various temperatures (40°, 60°, 80°, and 100°). Differences in the rates of penetration of such creosotes into capillary materials are regarded as due to variations in the viscosities or the solid-liquid contact angles.

The interfacial tension values against water of the experimental creosotes were found to vary by as much as 30 per cent., although no definite trend was present that could be related to other physical properties. Two hypotheses which might account for these disparities are advanced and briefly discussed.

Walker (J. C.) & Larson (R. H.). **Calcium cyanamide in relation to control of clubroot of Cabbage.**—*J. agric. Res.*, li, 2, pp. 183–189, 1935.

The results [which are tabulated] of experiments carried out in continuation of the authors' studies on the control of club root of cabbage (*Plasmodiophora brassicae*) [*R.A.M.*, xiii, p. 669] showed that in greenhouse tests calcium cyanamide [ibid., xiv, p. 151] at the rate of 250 lb. per acre prevented infection of the cabbage seedlings in club root-infected soil having a reaction of P_H 6·4, while a dressing of calcium hydrate at the rate of 525 lb. per acre was required to accomplish the same effect. Evidence indicated that the toxicity of the former substance to the parasite is due not only to the basic compounds formed from it, but also to the CN_2 anions in the soil solution before hydrolysis of the calcium cyanamide is complete. The doses required for effective field control were much higher, as was the case also with calcium hydrate, the results in both series of experiments indicating that calcium cyanamide is roughly about twice as effective, pound per pound, as calcium hydrate. It is suggested that in soils the acidity of which needs to be corrected to reduce club root, calcium cyanamide can be used in doses sufficient to satisfy the requirement in available nitrogen, and in cases where these doses are not sufficient to neutralize the soil acidity calcium hydrate should be used to supplement the cyanamide.

Whitehead (T.). **The effects of varying the distance to which Swedes are singled.**—*Welsh J. Agric.*, xi, pp. 228–235, 1935.

The trials reported in this paper were made in 1933 and 1934 at Bangor, Wales, in view of the evidence obtained by some New Zealand workers that the damage done to swedes by dry rot (*Phoma lingam*) may be minimized by close spacing of the roots [*R.A.M.*, ix, p. 151]. The results showed that, besides its influence on dry rot which only occurred on the most widely spaced plants (0·25 per cent. affected), closer spacing also tended to reduce the incidence of bacterial crown rot

caused by a strain of *Bacillus carotovorus* [ibid., xii, p. 546], and perhaps also bacterial root rot caused by another strain of this organism. On the other hand, it had no influence on the incidence of mildew (*Erysiphe polygoni*) [ibid., xiii, p. 76] and almost certainly none on club root [*Plasmodiophora brassicae*], and tended to favour the spread of leaf spot (*Cercospora* sp.), a disease which is stated to be of less importance than the others. It was also shown to increase the fresh weight yield of the crop by at least a ton per acre, and also to increase the feeding value of the roots.

GERLACH (M.). **Die Bekämpfung der Herz- und Trockenfäule der Rüben durch borhaltige Superphosphate.** [The control of heart and dry rot of Beets by boron-containing superphosphates.]—*Superphosphat, Berl.*, xi, p. 26, 1935. [Abs. in *Chem. Zbl.*, cvi (ii), p. 1425, 1935.]

Two new fertilizers have been developed for the control of heart and dry rot of beets in Germany [*R.A.M.*, xiv, p. 733], namely, a boron-superphosphate with 5 per cent. borax and 17 to 18 per cent. water-soluble phosphorous pentoxide, and Bor-Am-Sup-Ka [ibid., xiv, p. 613], containing 2·5 per cent. borax, 6 per cent. ammonia nitrogen, 8 per cent. phosphorous pentoxide, and 12 per cent. potash, the former to be applied at the rate of 4 to 5 and the latter at 8 to 10 doppelzentner per hect.

DECOUX (L.), ROLAND (G.), & SIMON (M.). **La pourriture du cœur de la Betterave en Belgique en 1934.** [Heart rot of the Beet in Belgium in 1934.]—*Publ. Inst. belge Amélior. Better.*, iii, 4, pp. 195–206, 3 figs., 1935. [Flemish, German, and English summaries.]

Exceptionally severe damage is stated to have been caused in Belgium in 1934 by heart and dry rot of sugar beets [*R.A.M.*, xiii, p. 348], which occasioned appreciable losses both among farmers and manufacturers. The disease has hitherto occurred only in a sporadic form in the country, and the recent outbreak is attributed to the coincidence of excessive drought, light soil, and high alkalinity of the latter (P_H 7·35 and 8·4). A summary is given of experiments conducted in other countries on the control of the disease by the application of boron to the soil [see preceding abstract].

SCHMIDT (E. W.). **Zur pathologischen Physiologie albicater und mosaikkranker Zuckerrübenblätter.** [On the pathological physiology of albicant and mosaic-diseased Sugar Beet leaves.]—*Phytopath. Z.*, viii, 4, pp. 363–368, 1935.

Further observations and experiments at the Klein-Wanzleben Sugar Factory, Germany, on 'albinism' of sugar beet leaves, an hereditary anomaly expressed by partial or total whitening of the surface, showed that pathological modifications in assimilation, nitrate and albumin metabolism, transpiration, and respiration are associated with the disturbance. Similar but less extensive changes were found to characterize the diseased portions of mosaic foliage [*R.A.M.*, vii, p. 355].

McDonald (I. M.). **Tests of curly-top resistant Beets.**—*Facts ab. Sug.*, xxv, 6, pp. 212–214, 1 fig., 1935.

In 1933 and 1934 the Holly Sugar Corporation, co-operating with growers in western Colorado, made a number of comparative test plantings with the U.S. No. 1 curly-top resistant strain of sugar beet [*R.A.M.*, xiv, p. 488] and selected European types. In 1934 the disease assumed a much more virulent form than in the foregoing year, and by mid-July the average amount of curly top in test plantings in the Delta district was 90·7 per cent. for the European varieties and 71·4 for U.S. No. 1, while at the end of the season the proportion of European plants showing severe injury was about double that recorded for U.S. No. 1. In 19 out of the total of 25 test plantings made in 1933 the yield of U.S. No. 1 exceeded that of the European varieties, the greatest difference in favour of the former being 5·65 tons per acre. In 1934 U.S. No. 1 outyielded the European strains in every case by 1·16 to 8·07 tons per acre. In only five out of the total of 39 test plantings made over the two-year period did the European varieties outyield U.S. No. 1 by a maximum of 1·75 tons per acre, and in all these fields curly top was relatively insignificant. The increased yield from U.S. No. 1 seed used in the Grand Valley in 1934 is estimated at 2,828 tons of beets from 1,414 acres and in the Delta district at 8,160 tons of beets from 2,245 acres.

Hughes (W.). **Investigations on the control of seedling diseases of Sugar Beet.**—*Sci. Proc. R. Dublin Soc.*, N.S., xxi, No. 22, pp. 205–212, 1935.

Sugar beet seed used in the Irish Free State is usually imported from the Continent, and the author gives a brief tabulated account of experiments in 1934 at Glasnevin, Dublin, in which the efficacy of seed treatment with ceresan prior to shipment, for the control of blackleg (*Phoma betae*, *Pythium de Baryanum*, and *Rhizoctonia* [*Corticium*] *solani*) [*R.A.M.*, xiv, p. 548] was compared with treatment with one liquid (germisan) and seven proprietary dust preparations in small lots just before sowing. Preliminary tests indicated that the seed used (Kühn P) contained 12 per cent. of seed-clusters visibly affected with *P. betae* [cf. ibid., xiii, p. 742], and that none of the treatments applied stimulated or increased germination of the seed, while the pre-shipment bulk treatment significantly reduced it, presumably owing to too long contact between the seed and disinfectant.

In randomized field experiments, the results of which were statistically analysed, germisan and ceresan (U.T. 1875 A) increased the number of resulting seedlings by 27·6, granosan [ibid., xiii, p. 488] by 25·6, and ceresan (old) by 21·7 per cent. over the control, while the remaining treatments, including the pre-shipment one, were not significantly better than the control. The increase in the number of seedlings is attributed to the controlling effect of the preparations on *P. betae*, mainly in preventing it from killing the seedlings before their emergence above the soil.

While blackleg did not appreciably affect the number of the sugar beets after singling in the field or the yield, seed treatment is considered

necessary owing to the moist conditions which usually prevail in Ireland during late spring and are conducive to the development of the disease.

ORTON (C. R.) & HENRY (W. D.). **An internal necrosis of Bean seeds.**—*Phytopathology*, xxv, 7, pp. 726–727, 1 fig., 1935.

An apparently new disorder has been observed affecting Wooster Mammoth and Jarvis bean [*Phaseolus vulgaris*] pods in West Virginia, the former variety being the more susceptible, with 47 out of 49 pods diseased compared with 10 out of 51. The seeds (one or more in each pod) showed pale yellow to dark brown, necrotic spots of very variable diameter in the centre of the flat inner surface of both cotyledons. No external symptoms of decay were detected. Attempts to isolate a causal organism from the necrotic pods were unsuccessful, and the disturbance would appear to be of a non-parasitic nature like the similar 'marsh spot' of peas [in England and Holland: *R.A.M.*, xiv, p. 279] and the internal spotting of western peas reported by Zaumeyer and Wade from Virginia [ibid., xiv, p. 341].

MAHONEY (C. H.). **Breeding Snap Beans for mosaic resistance. A progress report.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 483–484, 1934.

During the past four years numerous selections from commercial varieties and crosses of snap beans [*Phaseolus vulgaris*] have been tested in the field at the Michigan Agricultural Experiment Station for resistance to common mosaic (virus 1) [*R.A.M.*, xiv, p. 148]. So far only three F_8 progenies out of 22 from a cross of Wells Red Kidney × Refugee Wax showed over 10 per cent. infection, while eight were entirely free from disease; the average mosaic percentage of nine Stringless Green Refugee controls was 34·4. The above-mentioned family crossed on Green Refugee yielded 23 F_4 progenies of which ten showed over 10 and five under 5 per cent. infection. Only two F_8 progenies out of 17 from a 'black-seeded' selection contracted more than 10 per cent. mosaic, most of the lines of this type being very slightly infected (under 5 per cent.) in the field and suffering comparatively little crop reduction. Two Refugee selections were made in 1931 and yielded one progeny with marked resistance.

TATE (H. D.). **Intracellular abnormalities associated with yellow dwarf of Onions.**—*Iowa St. Coll. J. Sci.*, ix, 4, pp. 677–683, 1 pl., 1935.

The tissues of onions affected with yellow dwarf [*R.A.M.*, xiii, p. 146] contained a few very irregularly distributed intracellular bodies commonly resembling, and sometimes indistinguishable from, nuclei (to which they were usually in close proximity), but varying greatly in size, form, and structure. It is thought that they may be of nuclear origin and possibly resulted from amitotic nuclear division. In the tissues of apparently healthy onions multinucleate cells were occasionally found, some of which showed the presence of bodies resembling those seen in the diseased onions. This, if the onions were in fact healthy, would indicate a tendency of onion cells towards the multinucleate condition; while the presence of a virus in the protoplast of the cell

would probably increase the tendency of the nucleus to divide and produce abnormalities in the nuclei.

Böhne (F.). **Ueber Bekämpfung wichtiger Spargelkrankheiten und Spargelschädlinge während des Sommers.** [On the control of important Asparagus diseases and Asparagus pests during the summer.]—*Obst- u. Gemüseb.*, lxxxi, 7, p. 100, 1935.

Since 1928 asparagus rust [*Puccinia asparagi*: *R.A.M.*, xiv, p. 554] is stated to have been a veritable scourge in Germany, appearing in May and June on the young plantings whence it rapidly passes to the older fields. The affected plants shrivel and are unable to absorb the necessary reserves for the next year's crop, which consequently suffers not only in quantity but in quality. The sole reliable method of control consists in the timely destruction of all dead material, more especially on the young plantings, a practice formerly compulsory in Baden, but since fallen into disuse.

Ainsworth (G. C.). **Virus diseases of Cucumber.**—*J. Minist. Agric.*, xlii, 4, pp. 338–344, 2 pl., 1935.

This is an abridged, popular version of the author's recent account of the three virus diseases of cucumbers known to occur in England, namely, green-mottle mosaic (cucumber virus 3), yellow mosaic (cucumber virus 4), and yellow-mottle mosaic (cucumber virus 1) [*R.A.M.*, xiv, p. 554], and of their control.

Bailey (R. M.) & Burgess (I. M.). **Breeding Cucumbers resistant to scab.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 474–476, 1935.

Of 125 lots of cucumber seed tested in 1931–2 for reaction to scab (*Cladosporium cucumerinum*) [*R.A.M.*, xiv, p. 182], a destructive disease in Maine, 117 exhibited no resistance in the seedling stage. Two of the remaining eight lots contracted no infection, while the others showed varying degrees of resistance. None of these, however, belonged to the popular pickling and early-slicing type. Further work on the eight resistant seed lots showed that the two remaining free from scab in the previous tests maintained their resistance on continued selfing. From the limited data available, it appears that a small number of factors, possibly only one, are involved in the inheritance of resistance to the disease.

Mahoney (C. H.). **Seed transmission of mosaic in inbred lines of Muskmelons (Cucumis melo L.)**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 477–480, 1935.

In the spring of 1932 and again in 1933 several cases of mosaic occurred among seedlings grown from various muskmelon inbreds and crosses in Michigan in a form strongly suggestive of seed transmission [*R.A.M.*, xiv, p. 6]. Six out of 48 inbred progenies showed seed-borne mosaic, averaging 24 per cent. infection. Further selections were made from these progenies and in every case where the plant was infected it transmitted mosaic through the seed, the average percentage transmission being 15·6. Besides the inbreds 16 commercial varieties were grown in the field. Seed was saved from healthy and infected plants and grown in the greenhouse in the early autumn. The disease was

transmitted through the seed by all the plants of four lines showing mosaic symptoms at harvest time, the average percentage of infection ranging from 8·9 in line 1487 to 27·1 in line 1490. On the other hand, the three selections free from mosaic at harvest time did not transmit the disease to their progenies, while large healthy crops were also produced by non-infected selections from inbred Honey Rocks and open-pollinated Honey Net.

Currence (T. M.) & Leach (J. G.). **Progress in developing Muskmelon strains resistant to Fusarium.**—*Proc. Amer. Soc. hort. Sci. 1934*, xxxii, pp. 481–482, 1935.

In tests in 1933–4 in Minnesota to develop resistance to *Fusarium* wilt of muskmelons (the agent of which is stated to be allied to, possibly a mutant of, *F. niveum*) [*R.A.M.*, xiv, pp. 349, 419], a certain amount of promise was shown by the Honeydew, Casaba, Persian, and Honey Ball varieties with 35, 34, 43, and 30 per cent. infection, respectively, compared with 96 in Benders Surprise, 93 in Pollock, 89 in Sugar Rock, and 80 in Emerald Gem. Selection 73–33, with 56 per cent. infection, occupies an intermediate position between the resistant and susceptible types. The watermelon wilt due to *F. niveum* does not occur in the districts affected by the muskmelon disease, which does not, moreover, attack Kleckley Sweet watermelons, so that the origin of the severe epidemic in 1932 is obscure. According to a recent report, the same or a similar disorder occurs near Rochester, New York.

Price (W. C.). **Acquired immunity from Cucumber mosaic in Zinnia.**—*Phytopathology*, xxv, 8, pp. 776–789, 4 figs., 1935.

Ordinary (Porter's) cucumber mosaic and three other strains of the virus known, respectively, as 1, 2, and 9 (formerly cucumber virus Y) produce clearing of the veins and mottling of varying intensity in *Zinnia elegans* leaves, whereas strain 6 [*R.A.M.*, xiv, pp. 5, 782] causes the formation of bright yellow, later brown, necrotic lesions, sometimes involving the entire leaf and often extending down the petiole into the stem, killing the plant. *Z. elegans* plants inoculated with ordinary tobacco mosaic generally show no signs of primary infection, though small, chlorotic lesions may appear in three to five days, while vein-clearing has occasionally been observed a little later. The most prominent symptom, however, is a light and dark green foliar mottling, especially in the leaves just below the tip. Infected plants usually show extensive stunting. Tobacco aucuba mosaic produces in *Z. elegans* a mottling pattern composed of intermingled yellow areas on a dark green background, frequently accompanied by pale to vivid yellow zonate ring designs. A necrotic type of tobacco mosaic virus isolated from one of Jensen's yellow mosaic strains [ibid., xiii, p. 329] produces large necrotic primary lesions on *Z. elegans* leaves, while tobacco ring spot [ibid., xiv, p. 659] causes temporary vein-clearing and leaf rolling or curling and mild mottling. Similar but rather more severe symptoms are produced by Valleau's yellow tobacco ring spot virus [ibid., xii, p. 471]. Transferred to *Z. elegans*, severe etch [ibid., xiv, p. 782] produces persistent vein-clearing and distortion (without mottling) of the foliage and severe stunting of the plants.

Z. elegans plants contracting infection by any one of the four strains of cucumber mosaic mentioned above acquired immunity from the necrotic type (strain 6) of the same virus but not from the necrotic type of tobacco mosaic. Conversely, plants developing mottling by the tobacco or aucuba mosaic viruses acquire immunity from the necrotic type of tobacco mosaic but not from the necrotic cucumber mosaic strain 6. On the other hand, plants infected by tobacco ring spot, yellow ring spot, or severe etch acquire no immunity from the necrotic types either of cucumber or tobacco mosaic. The results of these experiments are considered to afford evidence of the specificity of the immune reaction in *Z. elegans* for both the cucumber and tobacco mosaic viruses.

Esau (Katherine). **Initial localization and subsequent spread of curly-top symptoms in the Sugar Beet.**—*Hilgardia*, ix, 8, pp. 397–431, 4 pl., 7 figs., 1935.

Continuing her investigations of the curly-top disease of sugar beets [*R.A.M.*, xiv, p. 487], the author gives details of her anatomical studies of healthy and diseased beet plants, the results of which showed that both external and internal pathological symptoms appear in young leaves that are closely and intimately connected by phloem tissue with the inoculated leaf, and that in the fleshy tap-root phloem degeneration first sets in on the side from which the inoculated leaf diverges; later the degeneration, which at first is strictly localized, spreads laterally in each ring, and from the older to the newly developing rings. Both in the leaves and in the tap-root, phloem degeneration is initiated near the first-formed sieve-tubes, before the mature xylem and protoxylem, respectively, are differentiated. Bodies interpreted as intracellular inclusions occur commonly adjacent to the first sieve-tubes, from which the virus seems to spread in the phloem, and less frequently in cells farther away from these sieve-tubes. These inclusions eventually disappear from those cells containing them which are not necrosed, and which usually develop into elements having all the characteristics of sieve-tubes.

These results are considered to support the view that curly-top virus is translocated in the phloem tissue, in particular in the mature sieve-tubes [loc. cit.; cf. also ibid., xiii, p. 674].

Redlich (H.). **Résultats des essais effectués à la sucrerie de Enns pour lutter contre la cercosporiose de la Betterave (Cercospora beticola Sacc.) en 1934.** [The results of experiments carried out at the Enns sugar factory to combat the cercosporiosis of the Beetroot (*Cercospora beticola* Sacc.) in 1934.]—*Publ. Inst. belge Amélior. Better.*, iii, 5, pp. 275–293, 17 graphs, 1935. [Flemish, German, and English summaries.]

Almost without exception the yield of foliage, root weight, and sugar content of beets treated with Bordeaux mixture or copper sulphate dust at Enns, Upper Austria, in 1934 against *Cercospora beticola* [*R.A.M.*, xiii, pp. 316, 348; xiv, p. 548] were higher than the corresponding values for untreated material. Under local conditions it is inadvisable to commence the treatments before mid-June. In most of the tests, Bordeaux mixture proved more reliable than copper sulphate dust, six applications of the latter at 10 per cent. being required to

produce effects comparable to those given by four treatments with the former at 2 per cent. Little difference was observed between the efficacy of the 1, 1·5, and 2 per cent. concentrations of Bordeaux mixture, but a strength of 0·5 per cent. was definitely inadequate, while above 2 per cent. the cost is too high to be lucrative. A concentration of 5 per cent. was too low for the copper sulphate dust, 10 per cent. being the minimum at which satisfactory results can be anticipated. Thoroughness of application of the disinfectants was found to be quite as important as the correct timing of the treatments. Hence better results were obtained in the series of tests conducted by scientific experts than in those made in the field by the growers, although the outcome in this case also was sufficiently encouraging. Even without treatment, some [unnamed] varieties for which selection firms claim resistance to *C. beticola* yielded better than the ordinary sorts. Conversely, however, some non-resistant varieties gave higher yields than the reputedly resistant strains under the same treatment.

Quinn (D. G.). **Causes of the short Victorian vintage for 1935. Black spot and other factors.**—*J. Dept Agric. Vict.*, xxxiii, 8, pp. 397–399, 403, 2 figs., 1935.

The heavy autumn and winter rainfall in Victoria in 1934–5 is considered to have predisposed the vines to infection by *Manginia ampelina* [*Gloeosporium ampelophagum*: *R.A.M.*, xiv, p. 616], a major factor in the poor vintage of 1935. A popular note is given on the life-history of the fungus, which under local conditions affects chiefly the Sultana, Muscats, Grenache, Doradillo, Rhine Riesling, Malbec, and Carignane varieties, as well as the drying and large-fruited table sorts, and on its control by the application of a late dormant spray of iron sulphate (20 lb.) and sulphuric acid (8 lb.) in 10 galls. water at the rate of 15 to 20 galls. per acre. A 10 per cent. solution of sulphuric acid is also reported to have given good results. Just as the buds are bursting the vines should be treated with strong Bordeaux mixture (5–5–10) plus casein followed by another Bordeaux spraying when the shoots are 6 to 8 in. long. Later treatment against downy mildew [*Plasmopara viticola*] should also prove efficacious against *G. ampelophagum*.

Bosc (M.). **Bouillies cupriques au sulfate d'ammoniaque.** [Cupric mixtures with ammonium sulphate.]—*Progr. agric. vitic.*, ciii, 24, pp. 562–566, 1935.

The author states that very satisfactory results were obtained by French vinegrowers in 1934 by the use of ammonium sulphate [*R.A.M.*, xiv, p. 75] with cupric sprays in the control of vine mildew [*Plasmopara viticola*]. In the light of further experiments the author considers that the amount of ammonium sulphate may be advantageously reduced, excellent control having been obtained in 1934 and 1935 by the following formula: copper sulphate 3 kg., lime 2·5 to 3 kg., ammonium sulphate 0·5 to 0·8 kg., in 100 l. water.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 7, p. 159, 1935.

France. By a Law of 10th March, 1935, modifying those of 4th August, 1903 and 18th April, 1922, failure to acquaint the purchaser of

a copper fungicide, raw material, or mixture with the copper content per 100 kg. of the preparation is made a punishable offence. The information is to be conveyed on the bill, invoice, packing material, advertisements, and other literature relating to the product concerned. Similar provisions are made in respect of the active elements comprised in any insecticides, fungicides, or other crop pest control materials.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 7, pp. 104–118, 1935.

GERMANY. Regulation No. 8, dated 20th June, 1935, of the General Association of the German Potato Trade defines the conditions, based on the requirements of the Reich Food Board, for internal and external commerce in table and seed (certified and uncertified) potatoes, including the limits of tolerance for certain diseases of the former. The plant protection authorities should be notified immediately by telephone of the detection of wart disease [*Synchytrium endobioticum*] in a consignment, the disposal of which will be officially arranged. In such cases the consignee is entitled to reject all liability for the goods.

Order by the Governor under section 2 of the Protection from disease (plants) Law 1925 (Law 10 of 1925) prohibiting the removal of any Banana suckers or Plantain suckers except under the conditions stated therein. The Protection from Plant Disease (Banana and Plantain Suckers) Order, 1935.—*J. Jamaica agric. Soc.*, xxxix, 6–7, p. 406, 1935.

The Protection from Plant Disease (Banana and Plantain Suckers) Order, 1935 (Jamaica), superseding that of 1925 [*R.A.M.*, v, p. 63] prohibits the removal, except with an official permit, of banana and plantain suckers outside the boundaries of any one estate or two adjoining estates owned or rented by the same person or company.

Plant Diseases Act, 1924.—Reprinted from *Govt. Gaz., Sydney*, 128, 2 pp., 1935.

By a Proclamation, dated 9th July, 1935, of the Governor of the State of New South Wales and its Dependencies in the Commonwealth of Australia, wheat rust (*Puccinia graminis*) is declared to be a disease within the meaning of the Plant Diseases Act, 1924. By a second Proclamation of the same date, every owner and occupier of land throughout the State is required to destroy all barberry plants growing on such land in order to prevent the spread of the said disease.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements. Lists of intercepted plant pests, 1934 (list of pests recorded during the period July 1, 1933, to June 30, 1934, inclusive, as intercepted in, on, or with plants and plant products entering United States Territory).—84 pp., 1935.

Among other interceptions made by officials of the plant quarantine and control administration of the United States Department of Agriculture during the period from 1st July, 1933 to 30th June, 1934 [cf. *R.A.M.*, xi, p. 544], the following may be mentioned: *Elsinoe piri* [ibid., xiii, p. 76] on apple from Switzerland; *Entomosporium maculatum*

[*Fabraea maculata*: see above, p. 771] on *Raphiolepis delacouri* from the Argentine; *Physalospora eucalyptina* on *Eucalyptus* sp. from Mexico; *Septoria citri* on citrus fruits from Australia, Egypt, France, Greece, Italy [cf. ibid., ix, p. 303; xii, p. 746], and Spain; *S. pittospori* on *Pittosporum* sp. from Scotland; *Sphaceloma fawcettii* var. *viscosa* on orange from Brazil; and *Phomopsis* sp. on loquat from Italy [cf. ibid., vii, p. 744].

United States Department of Agriculture. Bureau of Plant Quarantine. Fruit and vegetable quarantine. Amendment No. 6 of regulations supplemental to notice of quarantine No. 56.—2 pp., 1935.

As from 1st August, 1935, properly dried, cured, or processed fruits and vegetables, including dried products, cured figs, dates, raisins, etc., nuts and dry beans, peas, etc., may be imported into the United States without special permit or other restriction. Except as restricted, as to certain countries and districts, by special quarantines and other orders, the following fruits may be imported from all countries under permit and on compliance with the regulations supplemental to notice of quarantine No. 56 [*R.A.M.*, iii, p. 239]: bananas, pineapples, lemons, and sour limes. European or Vinifera grapes and any vegetable except as restricted above may also be imported at certain authorized ports on the presentation of satisfactory evidence as to their state of health. Upon compliance with these regulations and under such additional safeguards and conditions as may be prescribed in the permits, all fruits from Victoria, South Australia, and Tasmania may be allowed entry at Seattle, Washington, and Portland, Oregon, or elsewhere as indicated in the permits. Subject to official permission fruits other than those mentioned above may be imported through specially designated ports from New Zealand, Argentina, and Chile. In conformity with the regulations under Quarantine No. 28, oranges of the mandarin class, including Satsuma [*Citrus nobilis* var. *unshiu*] and tangerine varieties, may be imported from Japan through the port of Seattle or other specified northern ports. The entry of citrus fruits from the West Indies is permitted at New York and elsewhere as designated in the permits. The entry of pineapples from Jamaica is restricted to the port of New York or other prescribed northern ports. Irish potatoes may be imported from Mexico under the conditions of the order of 22nd December, 1913. Fruits and vegetables grown in the Dominion of Canada may be imported into the United States free from any restrictions whatsoever.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 8, pp. 180, 184, 1935.

Eritrea. By a Decree of the High Commissioner for the East African Colonies, dated 13th April, 1935, the introduction into and transit through Eritrea of plants, parts of plants, and bunches of bananas is prohibited except in the case of bunches from Italian Somaliland.

U.S.S.R. A Verbal Note of the People's Commissary for Foreign Affairs, dated 7th April, 1935, prohibits the importation of citrus fruits (oranges, mandarins, and lemons) by way of the Black Sea ports with a view to the exclusion of pests and diseases.

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